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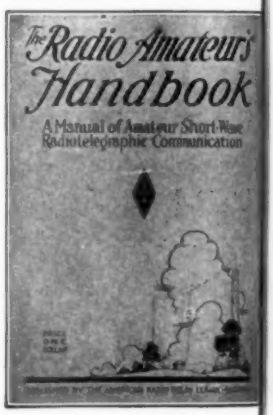

EIGHTH EDITION

By the Headquarters Staff of the A. R. R. L

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AMERICAN RADIO RELAY LEAGUE

WEST HARTFORD, CONN., U. S. A

• EDITORIAL •

WITH Secretary Warner busily engaged in Europe as a member of the United States delegation to the Copenhagen C.C.I.R., it falls to the lot of the assistant secretary to pinch-hit on the editorial page this month.

We'd like to talk a bit about that editorial of "KB's" last month; the one, you will remember, in which he mentioned some of the things that a League member gets when he signs on the dotted line. Many of those benefits are of an indirect nature, accruing automatically without further participation on the part of the members themselves and taken more or less for granted — as indeed they should be — as primary reasons for the creation of a coöperative organization. In this class are such things as technical development programs, *QST*, and representation of amateur interests at Washington and at international conferences. But it isn't about these we want to comment; instead, we have in mind other benefits which also are the outgrowth of organization and which are created and maintained for the individual member, but which accrue to him only if he takes advantage of them.

We are reminded of a passenger we noticed last summer on a transcontinental train trip. So far as we could observe he spent all of his time, except for brief trips to the diner, sitting in his Pullman sleeper seat, gazing listlessly out of the window hour after hour. Now a three-day trip on one train is no fun; it is, in fact, a darned tiresome ordeal. Recognizing this, the railroad company does everything it can to relieve the monotony and provide diversion for the passengers. There is a spacious club car, with its easy chairs, magazines and writing desks. Cool drinks can be had on hot afternoons. There may be a radio set, a barber shop and even a shower bath. All these are avialable to you when you buy your Pullman ticket. Without them a transcontinental train trip would be something to take once in a lifetime — but only once. Our friend across the aisle, however, apparently didn't know about them, didn't make use of any of these facilities provided for his comfort, and as a result had a thoroughly miserable time of it.

We have an idea some of our League members are in much the same situation. For, in addition to the indirect benefits of League membership already mentioned, there are many direct and personal benefits which are provided for the individual member, created and maintained solely to enable him to get more enjoyment from amateur radio. The point we want to make, however, is that whether or not he takes advantage of them is strictly up to the individual.

Our Information Service, for instance, can be of help to you only if you write us outlining your particular problems. The Communications Department may cook up a contest, but it is up to you to enter it if you want to enjoy the keen sport that characterizes such things as the all-sections sweepstakes or the international contest. The A.R.R.L. Standard Frequency stations provide marker transmissions of known accuracy — but you have to listen in on them yourself if you want to calibrate that receiver or frequency meter.

There are other less-known ways in which headquarters can help, too, if you will only let it. Perhaps you want to form a radio club in your city and are wondering how to go about it. Write us; we can help. You may have the club, but need a constitution. We have a model constitution written especially for ham radio clubs — it's yours for the asking. Is your gang planning a hamfest or a convention? Let us help with time-tried

advice that may save your committee many shekels and mean the difference between financial failure and success. Your town council, perhaps, is threatening to pass a local ordinance that will interfere with the operation of your amateur station. Drop us a line about it; we've had years of experience with such things and know the best ways to combat them. About this time of the year some of the more fortunate members are planning trips abroad. Give us a shout — we can tell you what the chances are of operating a portable set where you are going and can advise you how to get in touch with foreign amateurs. If you are one of our foreign members coming to America, write us before you start; we'll arrange introductions and try to make your stay as pleasant as possible.

In other words, League headquarters is more than a place where your membership is entered on the records, where *QST* is made up, where Warner "takes off" for trips to Washington and Copenhagen and The Hague on behalf of amateur welfare, and where the directors meet every year to formulate League policies. It is all of these, yes; but it exists also to afford the maximum possible return to you as a member, a place where you can go freely and frequently for assistance and advice on any matter pertaining to you as an amateur.

Learn to *use* your membership in the League.

— A. L. B.

In This Issue

Paul S. Hendricks, whose story on the W1XP transmitter appears in this issue, is the very same Paul Hendricks who spent the year 1928 at *QST* Headquarters working in the laboratory on Technical Development Program problems. Prior to that, Hendricks spent his summers at W1CCZ, where there is still much evidence of his skill in designing and building luxurious-looking equipment. The winters at that period were spent at WHAM, Rochester. On leaving *QST*, Hendricks joined the radio group at Colonel Green's estate near New Bedford, where he has been immersed in the various research problems under way. Not entirely relinquishing his active interest in Mr. E. C. Crossett's W1CCZ until the end of last summer, Paul was able to see all the old and new receivers, transmitters, power supplies and control gadgets installed in the new station room. This W1CCZ, by the way, is quite the finest amateur station we have ever seen.

Robert Brooke, when not "hamming," is Chief Engineer of WRHM at Minneapolis, Minn. The portable receiver which he describes in this issue has been much admired by amateurs in the Gopher State. At a recent banquet at Duluth, the receiver, dragging in a variety of signals, was passed around for the gang to see and hear. Evidently it made a fine showing.

James L. ("Single-Dial") McLaughlin attained fame (if not fortune) in the halcyon days of Super-Iodynes and such upon the publication in *QST* of his articles describing single-control super-heterodyne and neutrodyne receivers. That was 1924! Professionally, his career has landed him in such jobs as Chief Engineer for Precise Manufacturing Company; Assistant Art Director at Roxy's Theatre and Chief Engineer of Aviation Station WRNY-W2XAL. He is now busy with the last-mentioned. In between times, McLaughlin has pounded much brass.

Fred I. Anderson, responding to our request for details, says: "I am not a 'ham,' not an 'op'—merely a sort of fence-sitter on the side lines, looking on and saying nothing for the most part, but occasionally breaking into advice. I find that exploring radio regions with a slide-rule much more fascinating than solitaire. Last fall a fiction story of mine in the *Saturday Evening Post*, 'The Two Martimoes,' was so saturated with *QST* lingo that, I think, most of the active members of A.R.R.L. wrote in asking whence the QRM. I think you had better put me down as an amateur farmer living on the banks of the Farmington in company with a personal hydro-electric outfit whose commutator ripple is readable for 50 miles."

Louis F. Lauman, Jr., explains that the crystal oven described in his article was the last of a series of four. The first three failed to fill the bill. It is now used in the twenty-sixth transmitter which Lauman has built for himself since he first acquired an amateur ticket in 1927. The present rig has an 852 in the final stage with room on the rack for a 204-A. The idea of the oven, he says, was taken from W1MK's.

Duplex Phone on 56 Mc.

A Portable "Five-Meter" Transmitter Using Pentode Modulators; Further Notes on 56-Mc. Experiment

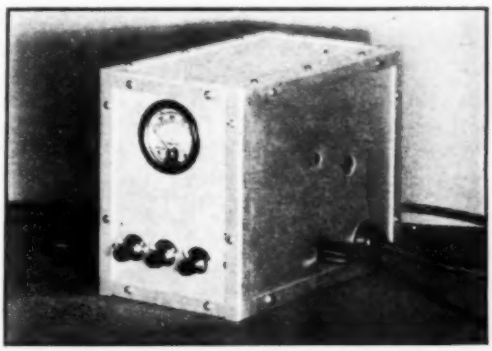
By Ross A. Hull, Associate Editor

THE more we "monkey" with 56-mc. apparatus, the firmer does our conviction become that it all has a valuable and completely practicable application in the field of ordinary amateur radio communication. During the last few weeks we have been engaged in 56-mc. experimental contact over periods totalling many days. In the work there have been disappointments (enough of them to keep our enthusiasm within reasonable limits), but the ease with which reliable short-haul phone communication is maintained with rudimentary equipment and very low power is a constant source of delight. Of course, as we have stated, there is really nothing new about it. "Five-meter" communication has been known for many years and doubtless some of it has been quite reliable. But, speaking generally, it has been a thing of the laboratory characterized by tricky circuits and much in need of delicate handling. To-day, we believe, 56-mc. working is ready to be hauled out of the laboratory by amateurs who can visualize its worth and to be installed as one more special tool in the amateur communication factory.

In one town we know about, seven or eight members of an active radio club converse nightly and at great length on a variety of subjects. Their total power consumption must be of the order of four or five kilowatts and their local "rag-chewing" (on the 3500-kc. band) must reach the far corners of the globe. Imagine what power would be saved and what widespread interference would be avoided if these fellows operated on the 56-mc. band! It can be done — and we think it will.

— Editor.

Last month a series of receiving tests were run with the receiver in an automobile and the transmitter at Headquarters. Since the last *QST* was put safely to bed, experimental work has been resumed with the idea of checking up on "two-way" communication and investigating the possibilities of "duplex." To permit this, a second transmitter and receiver were needed. Because an automobile had proved so convenient for "range" tests and the comparison of locations, it was planned that the new transmitter should be a companion to the small receiver described in the July *QST* and equally suited for operation in remote spots. It had to be small, relatively light, completely reliable, operative from low power and at the same time immune from the jolts and vibration it would certainly receive in being moved from one operating location to the next. The complete unit is to be detailed later in this article. Fundamentally, it consists of a low-powered push-pull oscillator, plate-modulated by a pair of pentodes in parallel. In the first experiments, the transmitter was supplied with plate power by a small dynamotor driven from the car battery. With the 300 volts available, a respectable output could be obtained and a series of tests was immediately planned. During the construction of the transmitter, George Grammer had rigged up an experimental super-regenerative receiver, and with this completing the foursome it was only a matter of minutes before two-way communication was established. This, of course, proved to be of tremendous advantage in the conduct of tests. Rapid changes could be made at both stations and reported on at all times, whereas in the past it had been necessary for the automobile crew to return to the office or to telephone from some town in order to exchange notes.



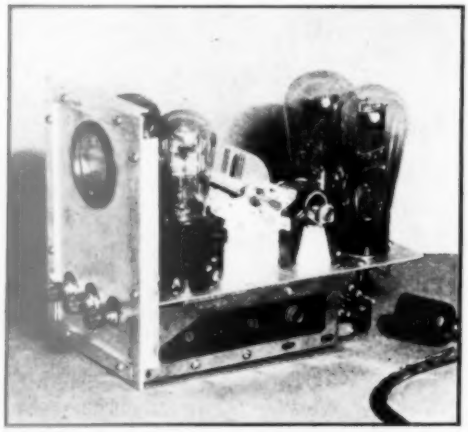
A COMPANION FOR THE SUPER-REGENERATIVE RECEIVER: THE COMPLETE 56-MC. TRANSMITTER

Ordinarily, this unit is mounted on top of the receiver and bolted to it.

At this stage, several trips were made in the car to points six or seven miles from the home transmitter. Because of the non-existence of amateur *mobile* licenses, transmission could be attempted only with the car stationary. Completely satisfactory signals were received from it, however, and

no particular effort was required at the office station to retrieve the signal at each stop. The low power and small antenna of the automobile station appeared to be offset by the larger receiving antenna at the office, with the result that similarly satisfactory signals were received at both stations. In transmitting over undulating country it was soon found that from locations in pronounced valleys the signal from the car dropped as abruptly as the signals received in it, whereas the climb to a point on the crest of even a diminutive hill immediately provided better signals at both ends of the link.

Just as soon as the effectiveness of both installations had been shown, an attempt was made to work "duplex." This involved setting one transmitter near the 56-mc. end of the band and the other near the 60-mc. end. Surprisingly, the interference in both receivers from their companion transmitters proved to be negligible. The only "snag" was severe interference in the automobile receiver from sparking at the brushes of the plate supply dynamotor. Experiment with our particular machine soon led us to decide on rearrangement of the transmitter to allow operation from batteries. But even with the handicap of the dynamotor interference, duplex working was readily possible over distances up to a couple of miles. Not a few hours of "chewing the fat" passed before we could get used to the novelty of conversing with the office from some back road as effectively as if



MINUS THE OUTER SHELL
The transmitter unit fitted with Type '47 modulators

we had had a connection through the telephone exchange. George Grammer, who operated the "office" station hour after hour, showed evidence of inexhaustible patience through it all.

During this period we had planned a trip to Round Hill and Cape Cod where, we knew, some 56-mc. activity was to be found. Paul Hendricks of Round Hill had lately been visiting Hartford, and tales of our 56-mc. stunts had gone back with him. On the day after our arrival at Round Hill, we drove over to Wianno (on Cape Cod) where we found, at Mr. E. C. Crossett's famed W1CCZ, a fine 56-mc. outfit all ready to shoot. In that "Ham's Heaven" (which fairly bristles with 861's, 849's and the like) John Dyer had arranged a push-pull oscillator with Type '52's modulated with a pair of 849's. In addition, he had built up a couple of super-regenerative receivers for the same band. Needless to say, the day was spent driving over that corner of the Cape checking and rechecking his signals. Strangely, the flat-wooded country of the Cape did not come up to our expectations. We had hoped that it would be almost ideal for the work but found instead that in every small valley and in the heavily wooded parts signals dropped sadly. Finding that the signals from W1CCZ dropped behind the noise "background" at about 15 miles, we decided that flat country was not necessarily good for 56-mc. unless both transmitter and receiver antennas projected well above houses and trees.

On the return trip to Round Hill that evening, we held a continuous watch for W1CCZ while John Dyer kept the transmitter on the air. Though we have no definite information, we imagine that John must only now be recovering from the effects of that three-hour talking bout. His signals, maximum strength for the first 12 miles, dropped irregularly from then on. At about 17 miles they sank out completely. From this point to New Bedford the road was particularly jammed with tourist traffic, and even if there had been signals they would surely have been drowned in the ignition QRM. On arriving at Round Hill (about 37 air miles from Wianno and half across water) we heard nothing of W1CCZ with the car parked outside the radio shack. Having a sneaking suspicion that the signals simply must have been flitting by overhead, we rigged the receiver indoors and hitched it to the standard 3500-kc. antenna at W1AXV — and Presto! W1CCZ was there full blast, still talking but very hoarse. After telling him this via 3500-kc. phone, we then proceeded to work him "duplex" with 3500 kc. one way and 56,000 kc. the other. Because of the limited distance and poor conditions, W1CCZ's 56-mc. stuff was considerably better than his transmission on 3.5 mc. Further tests the next morning showed that the height of the receiving antenna was quite critical. With anything lower than about 30 feet there were absolutely no signals. With the antennas higher than about 50 feet, the signals could be heard and read across the room. All of which is just a check on one of the few things we do know about 56-mc. work — that though it is not essential to "see" the transmitter in order to receive from it, the intervention of large objects (particularly the earth itself) is certain to play havoc with the signals. Experiment since the return to Hartford

has been concerned chiefly with the modification of the transmitter for battery operation (so to avoid the interference from sparking dynamotor brushes) and the checking of its performance at amateur stations around the town. As now operated, the four tubes of the transmitter draw 45 ma. at 135 volts and its performance naturally suffers by comparison with that of the higher-powered installations. Nevertheless, it still is capable of putting a fat signal across town even when four or five miles of odd houses block the view. In cases where it is not necessary to depend upon battery plate supply, it is obviously poor economy not to take power from the mains. It is only natural that the higher-powered version (operating at 300 volts) should be easier to handle and capable of producing a better signal. Because of this, we will describe the set as it was originally used, then mentioning those alterations which were made to allow the outfit to work satisfactorily with a battery plate supply.

From the illustrations, it will be seen that the transmitter has a somewhat similar appearance to the super-regenerative receiver described in last month's *QST*. This is because the chassis of both units are almost identical. The only difference in the transmitter frame is that the base plate is 9 inches instead of 8 inches from front to rear. The idea in making the chassis similar, of course, was to permit both transmitter and receiver to occupy similarly small metal boxes.

In planning the transmitter, we decided to depart as little as possible from normal practice so as to be able to demonstrate just how conventional and how simple a 56-mc. transmitter can be. We could have branched off into some dizzy unusual circuits and we could have made an attempt to incorporate a handful of unusual ideas. Such a course probably would not have resulted in any worthwhile improvement in performance, however.

In view of the splendid results which had been obtained with a modulated self-excited oscillator, we could see no reason for introducing the complications of an oscillator-amplifier system at this stage of the game — particularly in view of the desirability of conserving space. We did think, though, that a departure from the conventional modulator practice could be made with advantage. Experiment soon showed that pentodes in place of triodes as modulators would allow the use of a decent microphone without a speech amplifier tube, and that they would give us a reasonably high percentage of modulation without dropping lower the already very low oscillator plate voltage.

After considerable experiment, Type '71-A tubes were decided upon for the oscillator and Type '47 pentodes for the modulator. For the oscillator, the now famed "TNT" (fixed-tune grid) circuit was used with apparently complete

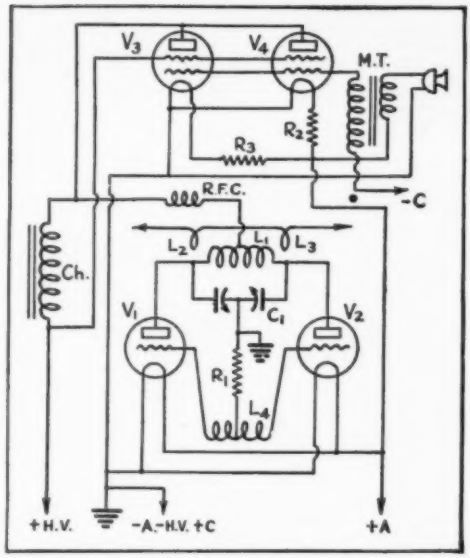


FIG. 1. — THE COMPLETE CIRCUIT OF THE 56-MC. TRANSMITTER

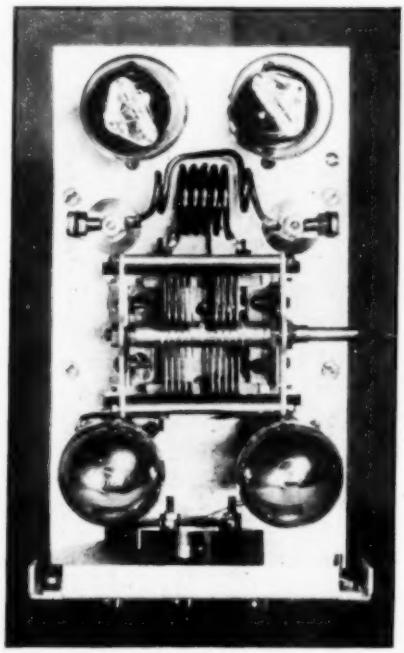
C_1 — Type 406B 25-plate Cardwell receiving condenser with stator split and plates removed to give 5 stator and 4 rotor plates in each section.
R_1 — 50,000-ohm Electrad wire-wound resistor.
R_2, R_3 — 2-ohm fixed filament resistors for Type '47 modulators; 12-ohm resistors for Type '33 modulators.
L_1 — 5 turns 1 inch inside diameter of 1/8-inch diameter copper tubing or wire.
L_2, L_3 — One turn each 3/4-inch diameter of similar conductor.
L_4 — 7 turns spaced 1/8 inch of 22 d.s.c. wire on 1/2-inch bakelite tube. Adjustment of turns and spacing may be necessary.
R.F.C. — 35 turns of 30 gauge d.s.c. wire on former 5/16-inch diameter. Turns spaced approximately twice diameter of wire.
M.T. — Microphone transformer made from old audio transformer with primary removed. New primary of 300 turns of 30-gauge d.s.c. wire. A split primary of 600 turns would serve for double-button type microphone.
CH. — Type 244 Silver-Marshall choke. Any similar choke rated at 150 ma., 20 to 30 henrys, would be suitable.
V_1 to V_4 — See text.

satisfaction. To the amateur who has read James Lamb's article in the July *QST*, no further details of it will be necessary other than that contained under Fig. 1. For the modulator, the conventional practice is followed. The only point of interest is in the necessary connection of the auxiliary grids to the plate supply side of the speech choke. Operating at 300 volts, these tubes are somewhat overloaded. This has not proved harmful, however, particularly when the control grids are slightly overbiased. It would be an advantage, possibly, to provide an auxiliary grid voltage lower than the plate voltage instead of depending on high control-grid bias to limit the plate current. This method was avoided in the present instance simply because of the complications it would have incurred. An examination of the characteristics of the Type '47 shows that at a plate voltage of 300,

with a control-grid bias of 20, the two tubes are capable of giving approximately 60 per cent modulation of the output of two Type '71 operated at the same plate voltage and with a plate current of approximately 80 ma. These are the conditions under which the tubes were operated. They are far from those specified by the tube makers, of course, but they have not resulted in any tube fatalities to date.

In view of the similarity of the chassis of this transmitter and the super-regenerative receiver, little need be said about it. As in the receiver, the radio-frequency components and wiring are all above the base, with the audio apparatus below. In the illustrations it will be seen that the two tubes of the oscillator are immediately behind the panel and mounted in ordinary tube sockets. Behind them is the split-stator condenser made up from a Type 406B Cardwell. As modified, it has five stator plates and four rotor plates in each section. It is so mounted in aluminum angles that the shaft runs laterally. A slot in the end of the shaft and a hole in the "can" allow the condenser to be set with a screwdriver. Behind the condenser and mounted directly on its terminals with lugs is the tank inductance. The feeders or antenna are coupled to it inductively with the aid of a split two-turn coil mounted on insulators. The particular insulators used were of Isolantite. G. R. sockets, through brass angles mounted on these insulators, serve as receptacles for plugs on the feeder or antenna leads. Two three-quarter-inch holes in the "can" allow for their passage. Because of their height and the limited space, the modulator tubes fit in sub-panel sockets of the type used on broadcast receivers. The sockets are available in most radio stores. The radio frequency choke, described under Fig. 1, is mounted under the tank condenser — above the base. The only remaining apparatus on top of the base is the fixed-tune grid coil. It is wound on a piece of ½-inch bakelite tubing supported with machine screws.

On the underside of the base, the arrangement becomes somewhat haphazard. Reference to the photograph will show the supply cable connector plate at the left top corner; the microphone transformer between the two modulator sockets; the speech choke at the right front; the grid leak on the left side and the three control switches on the front panel. The switches serve to open or close the filament, microphone and plate circuits. The remainder of the panel, as can be seen in other photographs, is devoted exclusively to the small 0- to 200-ma. meter which reads the total plate current of the four tubes.



THE R.F. COMPONENTS AND MODULATOR TUBES: A PLAN VIEW OF THE TRANSMITTER

Yaxley fittings are used for the supply leads — of which there are just four. Four-wire shielded cable has been fitted in place of the usual Yaxley cable. Obviously the original cable could be used instead.

The metal cases for both transmitter and receiver were made up to permit satisfactory suspension of the units in an automobile or airplane. They are, of course, unnecessary for most amateur work and since the details of their construction are made evident in the illustrations it is unnecessary to describe them. In operation, the two units are screwed together — the transmitter on top of the receiver — and the whole suspended with rubber straps.

In operation, the transmitter is just about the acme of simplicity. It has been dismantled and set up scores of times under all sorts of conditions and has yet to fail to put out signals of reasonably decent quality. Plate voltage (depending on the condition of the dynamotor batteries) has varied from 200 to 300 without seriously unfavorable consequences at the receiving end. The one important point in first setting up the outfit is to adjust the grid coil so that the point of minimum plate current (as the tank condenser is varied) occurs at the desired working frequency. Then, in adjusting for maximum output with the antenna, it is merely necessary to tune the tank condenser carefully until the plate current flips up to a sudden peak. The ordinary antenna or feeder meters would not respond to the very small currents to be expected in this case.

In order that the oscillator will provide a suitable plate load for the modulators, it is necessary that the plate current of the oscillators be somewhere in the region of 80 ma. Adjustment of the grid-leak resistance or of the antenna coupling may be necessary to bring the plate current to the right value.

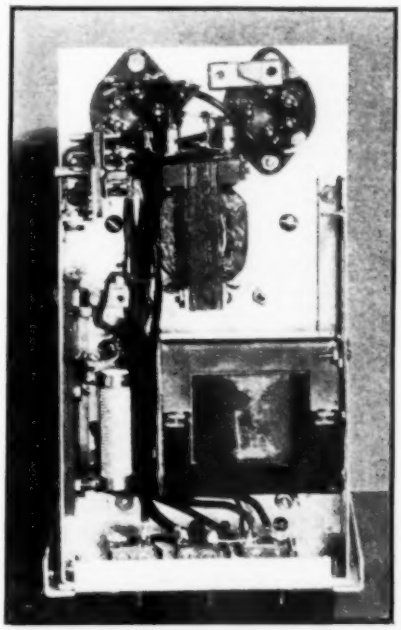
It is perhaps unnecessary to say that any well-filtered plate supply of about 300 volts is suitable for the transmitter. It is essential, of course, that the supply apparatus be capable of a continuous load of about 140 ma.

Because the antenna problem for 56 mc. was so thoroughly outlined last month, it is unnecessary to do more than describe the small affair used on the car. In the work, the set was slung behind the front seat of the sedan and feeders were run through the window to a quarter wave copper rod mounted on the spare tire on the front fender. This antenna, of course, was operated against the frame of the car as ground and was, therefore, "current" fed. This necessitated half-wave feeders with one connected to the antenna and the other to the frame of the car. The arrangement is shown in Fig. 2. The procedure in determining the correct length of antenna involves the use of the same old formula,

$$\text{Length (feet)} = \frac{468{,}000}{\text{Freq. (kc.)}}$$

And now for the modifications for battery operation. To limit running costs it was decided to use not more than 135 volts of plate supply. Experiment at this voltage showed the superiority of the almost forgotten 201-A's for the work. Their obvious companions as modulators were Type '33 pentodes. Their normal plate current is 14 ma. at this voltage with 13.5 volts negative bias. With the two of them in parallel, a suitable plate load for them is obtained when the oscillators are taking 35 ma. at the same voltage. Under these conditions, a percentage of modulation is obtained similar to that with the larger tubes.

The only essential alterations necessary to obtain these working conditions are to change the values of the filament resistors R_2, R_3 and to reduce the modulator bias. In some cases an adjustment of the oscillator grid leak may be necessary, but we found that 50,000 ohms gave satisfaction with both types of oscillator tubes.



RESERVED FOR THE AUDIO CIRCUITS AND POWER SUPPLY WIRING: THE UNDER-SIDE OF THE CHASSIS

As a microphone for most of the work we used an ordinary single-button type. Since the speech quality obtained from the transmitter will be directly dependent on the quality of the microphone output we can only suggest the use of the best possible microphone of medium output. Because of the high sensitivity of the pentode modulators it is actually possible to use a double-button microphone driving them directly. At least, we were able to do this with one good microphone available in the laboratory. It is possible that other types (with lower output) would be quite unsuitable.

An ordinary hand microphone was used with this transmitter chiefly because of its poor response to extraneous noises "on location." Also, it proved suitable for conversion to a "French type" hand-set. Just as soon as duplex working was shown to be practical, we rigged up the hand-set shown in the cover illustration on this issue. The single receiver, borrowed from a head-set, is mounted with a metal bracket to the handle of the old hand microphone. The thing not only looks but works just like the recent A. T. & T. product!

And again, in closing, it might be as well to say that the idea in writing this has been merely to present a simple practical piece of apparatus which has performed with satisfaction under a variety of operating conditions. It is not necessarily ideal in any respect. Technically it is, perhaps, a crudity. It has merit, however, in that it works.

Whoa! But there is a warning before we go. Whilst a transmitter of this type can be operated at a licensed station without special dispensation, it cannot be operated as a portable transmitter without a license for portable operation. Even this license does not allow transmission from a moving automobile. Mobile operation of a portable amateur transmitter is illegal.

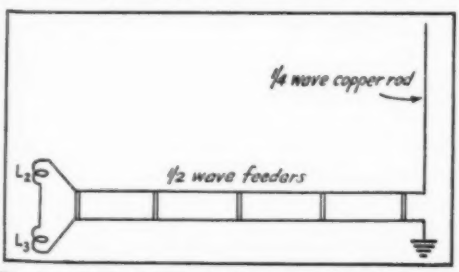


FIG. 2 — ONE ANTENNA SYSTEM USED ON THE AUTOMOBILE

Each feeder wire is 7 feet 6 inches long; the antenna exactly 4 feet.

Getting Ready for the Frequency Measurement Tests

Frequency Meter Suggestions—S. F. Transmission Schedules

PREPARATIONS for the Frequency Measurement Tests, scheduled for the month of October and announced in July *QST*, are going on apace. Official transmitting stations are being selected, Department of Commerce Monitoring Stations have signified their willingness to coöperate, and simple regulations for the contest are being worked out with the coöperation of all concerned. Complete details of the tests will be published in subsequent issues of *QST*, well in advance of the tests, so that every amateur will have that information in plenty of time. But the information will be of little use to those who are unprepared to use it. The way to be prepared is to build a frequency meter, if you do not already have one, calibrate it from standard frequency transmissions as many times as you possibly can and use it at every opportunity; because precision and accuracy in making measurements improves with practice. Repeated checking of the meter's calibration will reveal any bad habits it may have, too, and allow them to be corrected before the time of the tests arrives.

The following references contain complete information on the construction, calibration and use of frequency meters of the type that will be entirely adequate for the tests. Decide on a model that is to your taste — and go to it.

QST: "The High-*C* Heterodyne Frequency Meter," Nov., 1929; "Bringing Frequency Measurement Up To Date," Sept., 1930; "The Dynatron Frequency Meter," Oct., 1930; "W1MK's Dynatron Frequency Meter," Feb., 1931; and "A Combined Dynatron Frequency Meter and Monitor," May, 1931.

Radio Amateur's Handbook, Seventh and Eighth Editions: Chapter VI, "Frequency Meters and Monitors."

When the meter is built, choose a convenient s.f. transmission and make the first calibration. Here are the schedules for August and September:

DATES OF TRANSMISSION

Aug. 7, Friday	BB	W1XP
	B	W9XAN
	A	W6XK
Aug. 8, Saturday	BX	W6XK
Aug. 9, Sunday	C	W9XAN
Aug. 14, Friday	BB	W6XK
	B	W1XP
	A	W9XAN
Aug. 16, Sunday	BB	W9XAN
	C	W6XK
Aug. 21, Friday	C	W6XK
Aug. 23, Sunday	C	W1XP
Aug. 28, Friday	A	W1XP
	B	W9XAN
	B	W6XK
Sept. 4, Friday	BB	W1XP
	B	W9XAN
	A	W6XK
Sept. 5, Saturday	BX	W6XK
Sept. 6, Sunday	C	W9XAN
Sept. 11, Friday	BB	W6XK
	B	W1XP
	A	W9XAN
Sept. 13, Sunday	BB	W9XAN
	C	W6XK
Sept. 18, Friday	C	W6XK
Sept. 20, Sunday	C	W1XP
Sept. 25, Friday	A	W1XP
	B	W9XAN
	B	W6XK

STANDARD FREQUENCY SCHEDULES

Friday Evenings Schedule and Frequency			*Friday and Sunday Afternoons Schedule and Frequency*		
Time (p.m.)	*A*	*B*	*Time* (p.m.)	*BB*	*C*
	kc.	*kc.*		*kc.*	*kc.*
8:00	3500	7000	4:00	7000	14,000
8:08	3550	7100	4:08	7100	14,100
8:16	3600	7200	4:16	7200	14,200
8:24	3700	7300	4:24	7300	14,300
8:32	3800		4:32		14,400
8:40	3900				
8:48	4000				

Saturday Morning Schedule and Frequency	
Time (a.m.)	*BX*
	kc.
4:00	7000
4:08	7100
4:16	7200
4:24	7300

The time specified in the schedules is *local standard time at the transmitting station*. W1XP uses Eastern Standard Time, W9XAN, Central Standard Time, and W6XK, Pacific Standard Time. Schedule BB transmitted by W1XP is intended particularly for European amateurs and starts at 2100 G.C.T. Schedule BX is transmitted especially for amateurs in Oceania and the Far East. It is transmitted starting at 1200 G.C.T. by W6XK. Reports on these special schedules are particularly desired, not only from overseas hams but from those in the Americas.

Although the frequencies of the transmitting stations are not guaranteed as to accuracy, every effort is made to keep to within 0.01% of the announced frequencies. The frequency standards are calibrated against the National Frequency Standard. Frequent checks on the transmissions

(*Continued on page 46*)

A Companionable Portable Receiver

By Robert O. Brooke, W9CH*

THIS article is a description of a mighty interesting little set that has been knocking around the Dakota Division for some time. *QST* prints several stories each year concerning varieties of portable equipment and they constitute an interesting record of development in this branch of amateur radio. The ultimate is never reached, of course, yet the unit described in this article comes rather close to claiming the award for versatility and performance in sets of its class. This receiver's history is full of refinements, although during the past few months not a change has been made. Therefore, this story is written for the approval of the gang, whether sea-going, traveling, vacationing or just regular stay-at-home brass-pounding hams.

Numerous stations owe this midget a debt of gratitude. It has been instrumental in getting many a new man on the air. It is always ready and available when a brass pounder in distress calls and wants to borrow the portable to calibrate his new receiver's coils, to make his xtal work, maybe to help him hunt down some bothersome QRN, or again just to listen to his modulation or check his wave. One of the old timers about town has termed it "a life saver, a radio inspector, and a Bureau of Standards, all in one."

As a car set it does wonders. All types of signals may be copied easily when using phones and a small amplifier makes these signals capable of driving a loud speaker.

Here is a summary of its capabilities:

1. Portable — Requires but a corner of a suitcase. Ready for operation with anything for an aerial.

2. Battery Life — Operates satisfactorily on less than 35-ma. filament current. With normal use the "A" battery lasts in excess of three months. The "B" and "C" batteries last indefinitely.

3. Sensitivity — When used with a good antenna foreign DX is heard easily and loudspeaker volume is obtained on local amateur, police, and broadcast stations. The noise-to-signal ratio is so low that stations barely readable on large receivers may be copied easily.

4. Operation — The set covers a frequency range of approximately 18 mc. to 600 kc. and may be used as a station receiver, a car receiver, an interference hunter, a monitor, or a vacuum-tube oscillator.

This receiver was originally designed and built by the writer about two years ago, when he had rather serious intentions of going back to sea. As usual, the ancient file of *QST* was thoroughly gone over. The result was a set using Type '99 tubes, capacity regeneration control, a single tuning condenser, and coils for only the amateur bands. The performance of this receiver was quite satisfactory with the exception of a few kinks such as short battery life, microphonic '99's, limited band coverage, and changes in tuning with regeneration adjustment. With the advent of the Type '30 two-volt tube the receiver was completely redesigned and the present set described in this article evolved.

The receiver is entirely self contained in an aluminum box measuring 5" x 6" x 9". Two Type '30 tubes are used with filaments in series in a conventional regenerative circuit with one stage of audio. Six coils are required to cover the frequency range of from 17,640 to 600 kc.

*3848 Harriet Ave., Minneapolis, Minn.

CONSTRUCTION

Before beginning to outline the constructional details, let me digress a bit on the importance of care and attention to those details in the early stages of construction. A neat looking finished

THE PORTABLE RECEIVER WITH ITS COILS

In spite of its small size — the can is but 5 by 6 by 9 inches — it is completely self-contained and has a good "sock." The large dial is for tuning the regeneration control being to its right above the filament switch and phone jack. The plug-in coil mounting, band-setting condenser knob, and antenna-ground binding posts are mounted on the left side of the box.

job is dependent to a great extent upon the care taken in building the cabinet and mounting the various parts. A good workman is usually a cautious workman. Good tools save time and labor. Engraving if available costs little and often adds that finishing touch. Make old parts look like new before putting them into a new unit. Use nickel plated screws when working on

aluminum. In wiring be careful of frayed ends and messily soldered connections. Clean the soldering iron on a piece of cloth each time it is used. If an insulation end becomes frayed from heat it may be put back in shape easily by running resin from resin core solder over it with a hot iron. The use of "push-back" wire makes wiring easy since the insulation pushes back from the end, doing away with the necessity for skinning the insulation. Audio and d.c. leads may be cabled.

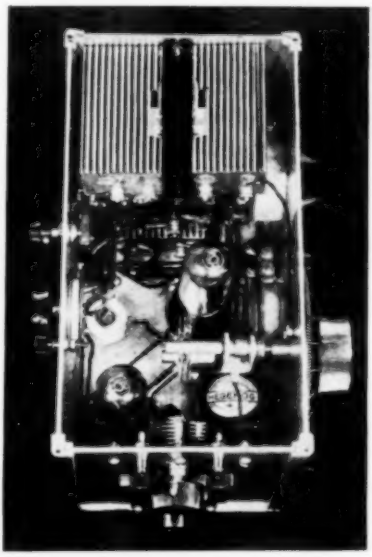
In designing the receiver a great deal of attention was given to the fact that rapid coil change was important. It was thought undesirable to mount the coils on the inside of the can as the physical structure of the box makes the use of a hinged or loose fitting cover impractical. It might have been mounted on top of the box but access to the interior then would have been difficult. The cover could have been made plug in, by using a plug and socket arrangement; that is, by fitting plugs to each corner of the top and then reaming out the corner holes in the box for the plugs to fit into. But this is rather unsatisfactory from the standpoint of rugged construction although it has its points if the equipment is to be used for station work or as a monitor. The final decision was the left-hand side of the box where the coil is readily accessible and easily shielded.

The Alcoa aluminum can comes knocked down and its various pieces are satin dip finished. Since this finish is rather soft and porous, showing dirt and scars very easily, it is removed with medium steel wool and oil. The finish thus obtained is hard and easily cleaned. Rubber feet, such as those sold by five- and ten-cent stores, are used on the bottom of the box. They are mounted by drilling a small hole in each corner of the bottom, and after inserting the nail portion of the rubber foot it is bent over sharply with a hammer.

A handy tool for working aluminum or bakelite panels is the $\frac{1}{8}$" to $\frac{1}{2}$" tapered reamer, obtainable at most hardware stores. This little tool saves the expense of a number of drills as it quickly and easily reams to size any hole over $\frac{1}{8}$ of an inch. Holes are cut with this reamer for all the binding posts, condensers, jacks and switches. The binding posts are set clear through the panel onto a strip of eighth-inch bakelite, insuring against the possibility of a ground or high capacity to ground. The jack and regeneration potentiometer are insulated from the panel with insulating washers. The switches, condensers, and rheostat are mounted directly on the panel. The switches are insulated in themselves and the condensers and rheostat are grounded on one side in the circuit.

The coil socket is a UY-type Pilot or Eby with the soldering lugs bent down. It is first mounted on a square piece of $\frac{1}{8}$-inch bakelite with holes drilled just large enough for the lugs to slip through. Then this unit is mounted on the metal panel, the panel having holes to correspond with those in the bakelite except that they are reamed to $\frac{3}{8}$ inch to provide plenty of clearance for the lugs. The connections are to the lugs from the inside of the cabinet and a $\frac{1}{4}$-inch piece of spaghetti tubing is slipped over each to insulate the connection.

The "A" and "B" batteries are mounted on the opposite side of the box from the coil socket. This side is left free to slide out when the battery wires are disconnected, providing another means of access to the interior besides that from the top. It also facilitates the easy changing of batteries. The batteries are clamped to the side with brass strip lacquered black. The "C" battery is mounted directly on the base underneath the "B" battery. This battery is not removed with the others as it is rarely necessary to replace it.



A TOP VIEW OF THE SET WITH ITS COVER REMOVED

The batteries are held in place by clamps at the rear end. The filament rheostat and binding posts for connecting external batteries are at the right. Other components described in the text are readily recognizable.

While on the subject of the aluminum box it will be well to mention that special care must be taken to avoid noise caused by the various sections of the box making poor contact. In this set a common ground lead bonds all sides. The corner pieces on the coil end only are squeezed in a vice before assembly, making them fit so snugly that they must be hammered into place.

The r.f. chokes are standard Aero chokes with the cases removed. The units were found in the good old junk box and had been put there either because they were open or noisy. In this type of choke after a few soldered connections to the lugs they often become open due to breakage or poor connections of the coil leads to the lugs. Upon opening the first choke it was a pleasant surprise to find a beautiful looking coil, wound like a honeycomb coil and already

doped to prevent unraveling. The coil was left on the bakelite core and connections were made directly to the coil leads.

A midget battery switch is mounted in the back of the cabinet for use in cutting off the internal "B" battery when an external battery is used. An external 45-volt "B" battery is rarely called for but by using one the signal strength will be increased slightly. A double-pole switch could be used to cut off both the internal filament and plate supplies at once.

The use of both capacity and inductive antenna coupling makes possible the shifting of dead spots and experimental work on different types of antennas.

THE PLUG-IN COILS

The coils are wound on five-prong tube bases with No. 20 d.c.c. wire. The only coil that requires special discussion is the long-wave coil shown in Fig. 2. This coil is wound on hard rubber tubing of a size to fit tightly over the tube base. The tubing is 3 inches long and is bolted to the base with 4/36 brass machine screws. The "natural" range of this coil and its associated variable tuning condensers is approximately 2000 to 1200 kc. However, this range is brought to a frequency of slightly under 600 kc. by the introduction of fixed capacities. Four 50-$\mu\mu$fd. Aerovox fixed condensers just fit nicely inside the coil. The taps from these condensers are brought out on top of the coil to three switch points mounted in a small piece of $\frac{1}{8}$-inch bakelite, glued and pinned into the top portion of the hard rubber tube. Two of these condensers are in parallel with the other two brought out to switch points separately. Two switch arms make possible any combination of these capacities as also shown in Fig. 2. The tickler coil is wound to go just out of oscillation on the minimum setting of the regeneration control when minimum capacity is across the circuit.

The coils are made moisture proof and strong mechanically with several coats of collodion.

COIL DATA

Coil	Freq. Range. (kc.)		No. Turns L_1	L_2	L_3
A	17,640	9680	2	6	6
B	9680	6250	3	11	10
C	7000	3945	4	18	14
D	4290	2725	6	28	15
E	3155	1765	10	50	16
F	2000	600	10	80*	18

* Shunted by fixed capacities as shown in Fig. 2.

Clear lacquer is also good and probably has less tendency to peel off. The coils are lettered as to frequency or wavelength values before the collodion is applied. Any good non-conducting ink does nicely and furnishes an easy method of quickly picking the correct coil. The ticklers are scramble-wound and are fixed inside the tube bases with collodion. They are wound on the finger tips, tied with white thread, and then formed and mounted to the interior of the base. Considerable change in frequency and oscillation may be had by varying the coupling of the tickler

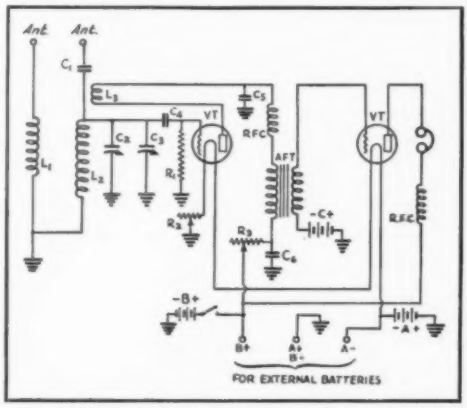


FIG. 1 — SCHEMATIC CIRCUIT OF THE PORTABLE RECEIVER

L_1, L_2, L_3 — See coil table and text.
C_1 — Small fixed antenna coupling condenser.
C_2 — 5-plate midget tuning condenser.
C_3 — 13-plate band-setting midget condenser.
C_4 — 50-$\mu\mu$fd. mica grid condenser.
C_5 — .002-μfd. mica plate by-pass condenser.
C_6 — .5-μfd. by-pass condenser.
R_1 — 10-megohm grid leak.
R_2 — 30- or 50-ohm filament rheostat.
R_3 — 100,000-ohm variable regeneration control resistor.
RFC — Radio-frequency chokes; see text.
AFT — "Hedgehog" 14o-3 audio transformer.
VT — Type '30 2-volt tubes.
A — 4.5-volt "C" battery for filament supply.
B — Small 22.5-volt "B" battery.
C — 3-volt "C" battery.
"Grounds" indicate connections to aluminum shield.

inside the base before permanently fastening it in place. The antenna coils are in some instances mounted inside the base, especially if no room is to be found on the outside for them. The coil table given will serve as a guide but the figures may require slight modification since each set has its own characteristics and the coils for it may differ considerably.

Little will be said about the adjustment of this receiver because the operation is similar to that of any set. It will be well to mention, for economical reasons, that the filament current should be adjusted to a minimum. The tubes operate with no noticeable decrease in signal strength with a current of but 35 ma. With this drain the batteries seem never to wear out.

Several very bothersome cases of interference have been hunted down and located to within ten feet with the aid of this receiver and five feet of aerial. Two of these cases were in large buildings where the source of the disturbance could not be seen. The set was carried about the halls, the location of the interference determined, and then

an investigation conducted to discover the cause and its remedy.

At home the set performs many duties. Transmitter key leads are arranged on the bed for remote control operation. Every night the receiver reposes there, too, and many a local or foreign QSO is made in the wee hours of the morning when it's too cold to get out of bed, even to QSO an Aussie or Zedder. As a monitor it performs nicely with a shield slipped over the coil end of the can. It sometimes runs for hours on the police stations. Being connected with a broadcasting station, the writer listens in as much as possible to his station's programs. Late at night it is mighty handy to be able to tune in without waking the family, not to mention the neighbors.

A few rather interesting incidents have made the ownership of this portable very much worth while. The owner of an expensive and powerful amateur station once made a friendly wager with the author. He was a man who consistently boasted of his terrible receiving location. He had

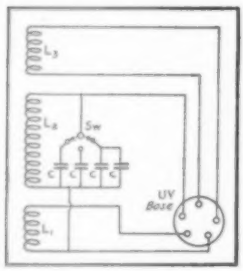


FIG. 2 — SCHEMATIC ILLUSTRATION OF CONNECTIONS FOR LONG-WAVE COIL

Small fixed condensers of 50-μμfd. capacity each are mounted within the coil form and connected to a tap switch as shown in one of the photographs.

tried every receiver ever mentioned in *QST* and at the time was using a push-pull screen-grid r.f. and push-pull detector arrangement that was giving him good results on foreign contacts. His wager was that a foreign QSO could not be made with his station if the portable were used for receiving. Needless to say, this would not be related if the test had not been successful. Five minutes after putting the set down on the operating table and attaching the aerial, a Brazilian was raised and a half-hour QSO ensued. Not content with one foreign contact, the evening was spent in making several more.

In another instance, at a Naval Reserve meeting, the station's receiver batteries went dead about the time they were to keep their schedule with the net control station. The portable saved the day by being along in its owner's car; and when called upon to pinch-hit, it did that — and operated several pairs of phones besides.

Another time, the writer was on a business trip and stopped at a brother amateur's to keep a schedule with the home station. A satisfactory QSO was impossible with the station's more elaborate screen grid receiver, due to severe interference and static, so the trusty midget was called upon and a 100% QSO was carried out.

Rocky Mountain Division Convention

Hotel Argonaut, Denver, Colorado, August 21st–22nd

THE Associated Radio Operators of Denver as sponsors of this annual convention cordially extend an invitation to all radio amateurs to attend our affair.

A good program has been prepared and the committee is working hard to make this convention the most interesting one of all.

Our new director, Mr. Andrews, is giving his full coöperation and A.R.R.L. headquarters is sending E. L. Battey, Assistant Communications Manager, as its representative.

Further information may be obtained from Artie D. Davis, 2459 So. Sherman St., Denver, Colo.

Midwest Division Convention

(Upper Missouri Valley) Sioux City, Iowa, August 28th–29th

HURRAH! fellows. Everybody is excited in this section. The Tri-State Amateur Radio Club will be the host at this the first real A.R.R.L. divisional convention to be held in this part of the country, and a royal good time is assured to all delegates. Full information will be mailed to all members of the League, but get everybody to talk about it over the air and let's boost-up this section — we can do it, too. In the meantime drop a note to Richard W. Pitner, W9FZO, 514 20th St., Sioux City, Iowa, and tell him you will be there.

Midwest Division Convention

Kansas Section, Topeka, Kansas, September 5th–6th

ONCE again the Kaw Valley Radio Club has the pleasure of extending a cordial invitation to all amateurs in Kansas and neighboring states to attend their convention to be held at Topeka, September 5th and 6th. Frank K. Tiffany, Secretary, 417 West Seventh St., Topeka, Kans., would appreciate hearing from those expecting to attend.

Pacific Division Convention

(12th Annual)

Hotel Clift, San Francisco, Calif., September 5th–6th

Auspices: Associated Radio Amateurs of San Francisco. George W. Mesher, Sec'y, 2949 Sacramento St., San Francisco, Calif.

The Standard Frequency Transmitter at W1XP

A Combination Medium- and High-Power Set for Exact Transmission*

In Two Parts—Part I

By Paul S. Hendricks, W1AXV-W1XP**

THE transmission of standard frequency signals previous to January, 1931, was carried on at the Round Hill Research Laboratories of the Massachusetts Institute of Technology, in collaboration with the A.R.R.L., by means of both self-excited and oscillator-amplifier type transmitters. More lately, in order to keep up with the progress being made in the art of frequency stability and measurement, an improved type of oscillator-amplifier transmitter has been designed, constructed and placed in operation.

This transmitter, although designed primarily for precise standard frequency service, will appeal to every transmitting amateur whether he be a high-power low-power or medium-power enthusiast; whether he believes in crystal-controlled or self-controlled transmitters; whether his field of activity is c.w. or phone — for it features all and does it well. It should be particularly interesting to those who appreciate ready adaptability combined with exactness of adjustment in an amateur transmitter, and anyone who listens to the standard frequency transmissions of W1XP knows the rapidity and exactness with which this stable transmitter can be tuned. The unit described in Part I is in itself a complete 75-watt transmitter — in fact, two complete 75-watt transmitters. But now to the story. — Editor.

The frequency standard which is being used by station W1XP and the method by which standard frequency signals are transmitted has been described in a recent article.[1] Briefly, the method is to monitor the output of a variable frequency transmitter by adjusting it to zero beat with a known harmonic of the 100-kilocycle standard piezo-electric quartz oscillator. Contrary to a somewhat general belief, the transmissions are not directly controlled by the piezo standard oscillator because of the difficulties involved in sufficiently amplifying such weak harmonics as the thirty-fifth or higher, as would be necessary in this case.

The present method of adjusting the transmitter to zero beat with known harmonics of the standard permits a much greater accuracy to be maintained on the transmissions than ordinarily can be employed by observers and therefore direct control by the standard has not been considered necessary, at least up to the present time, although a system of direct control by the frequency standard may be employed at some time in the future.

The transmission of standard frequency signals over a period of several years with power outputs of 200 to 400 watts showed that they are generally received with excellent signal strength anywhere in the eastern half of the United States and Canada and frequently with good intensity on the West Coast of the United States and Canada, and with good consistency in foreign countries as far away as the Antipodes. This experience showed that an oscillator-amplifier transmitter having an output power of 500 watts would be satisfactory. Accordingly, a tube having the above rating was adopted as the final amplifier and the necessary tubes and associated apparatus to precede it were selected so as to properly excite such an amplifier.

PLANNING THE TRANSMITTER

The work done with the earlier type transmitters indicated a number of things which should be taken into consideration when building a transmitter for this exacting service. First, the system must be very stable so that it will maintain a constant frequency after having been set to the desired value. Second, shielding should be employed to protect the controlling oscillator from the stray fields of the rest of the system. Third, there should be at least one stage between the controlling oscillator and the output power amplifier, to act as a buffer to prevent keying and other disturbances from affecting the oscillator. Fourth, the adjustments should be as simple as possible in order that rapid and accurate changes in frequency may be made. Fifth, a fine adjustment device for the oscillator is essential so that its frequency may be maintained easily at zero beat with the standard against which it is being monitored. Sixth, there should be no frequency variation whatever when the transmitter is being keyed, otherwise it is not possible to ac-

* Contribution from the Round Hill Research Division of the Massachusetts Institute of Technology.

** Round Hill, South Dartmouth, Mass.

[1] Chinn, "Standard Frequency Station W1XP," *QST*, Jan., 1931.

curately monitor the signal against the standard or to permit the user of the signal to employ it to the best advantage. Seventh, it is necessary to have the circuits so arranged that they can be shifted readily from one to another of the various amateur frequency bands. It is also desirable that with a given set of coils each tuning circuit should cover approximately the same frequency band and that the transmitter should be readily adaptable to experimental work on any frequency in the operating spectrum.

From these considerations it was decided that the transmitter should be built into two entirely separate units and have a continuous frequency range including the three amateur bands of 3500, 7000 and 14,000 kc., on which the standard frequency signals are transmitted. The two units are termed the "exciter" and the "power amplifier."

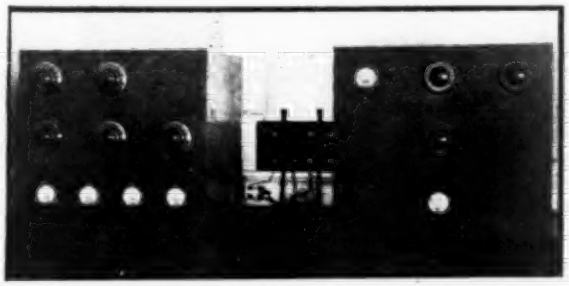
The exciter unit consists of four stages. The first two stages, a crystal oscillator followed by a low power amplifier or frequency doubler, are used for work other than the scheduled standard frequency transmissions. Following these there is a stage which is primarily intended to be a variable frequency oscillator but which also may be used as an amplifier or a frequency doubler. This is followed by a buffer amplifier stage, which completes the exciter unit. The second unit contains the 500-watt output power amplifier. There are thus five stages in the complete transmitter.

When the transmitter is operated with the self-controlled oscillator, that is, when the first two stages are not being used, the three stages in use are all tuned to the operating frequency. When the transmitter is crystal controlled to operate in the vicinity of 3500 kc. all five stages are tuned to the same frequency. When operation is desired in the vicinity of 7000 kc. the crystal oscillator remains in the vicinity of 3500 kc. and either the second or third stage may be made the frequency doubler. Thus, there may be the crystal oscillator on 3500 kc. and four amplifier stages on 7000 kc., or the crystal oscillator and first amplifier may be on 3500 kc. and the remaining three amplifiers on 7000 kc. For operation in the vicinity of 14,000 kc. both the second and third stages function as frequency doublers. Thus, the crystal oscillator will be on 3500 kc., the following amplifier on 7000 kc. and the remaining three on 14,000 kc.

The exciter unit may be used by itself as a transmitter having an output of 75 watts. Also, the amplifier unit may be excited from any other available source of radio frequency power such as a transmitter having an output of 50 to 100 watts. Since the two units are entirely separate except for the transmission line which passes the radio frequency excitation to the amplifier, they will be described separately. The reader may be interested exclusively in the first unit as a complete medium-powered transmitter or in the second unit as a high-powered output amplifier to be added to his present installation.

MECHANICAL CONSTRUCTION

The four stages of this exciter are built into one unit which measures, overall, 24 inches long, 21 inches high and 18 inches deep, not including the front panel. A general idea of the appearance and arrangement of the unit may be gathered from the photos. The front panel is composed of three sections of black bakelite, each section being 24 inches long, 7 inches high and $\frac{3}{16}$-inch thick. The three dials across the center of the panel operate, respectively (from left to right), the variable tank capacitors of the crystal oscillator, the 75-watt oscillator and the buffer amplifier. The dial at the left above that of the crystal oscillator operates the frequency doubler tank capacitor. The one at the center above that of the oscillator operates the fine frequency adjustment. At the upper right hand corner of the panel is placed a card holder on which are noted the dial settings for the frequencies that are used regularly. The meters along the bottom panel indicate the plate currents of the crystal oscillator, frequency doubler, oscillator and buffer amplifier, respectively.



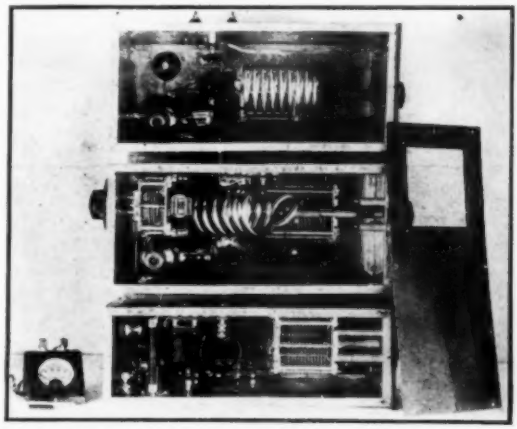
THE TRANSMITTER CONSISTS OF TWO SEPARATE UNITS

The exciter unit, which is in itself a complete 75-watt transmitter, is at the left and the 500-watt screen-grid amplifier used for the standard frequency transmissions is at the right.

Photographs courtesy of M. I. T. Photographic Service.

There are three shielding compartments made of 40 mil copper sheet. The top and bottom horizontal edges are formed by $\frac{1}{2}$ x $\frac{1}{2}$ inch angle brass. The outer surface of one side of the angle brass is soldered to the inside of the copper walls, the top and bottom pieces of copper being then fastened by means of small machine screws to the other outer surface of the angle brass. The compartment on the left, which houses the crystal oscillator and frequency doubler stages, is 18

inches deep, 14 inches high and 6 inches wide. The middle and right hand compartments, which house the oscillator and buffer amplifier stages respectively, have the same height and depth as the left hand compartment but they are 8 inches wide. These compartments occupy the space behind the two upper sections of the front panel and rest on a ½-inch baseboard of whitewood. The baseboard is supported by a framework of 1 x 1 inch whitewood pieces. This framework is finished with walnut stain and shellac.



INTERIOR VIEW OF THE EXCITER UNIT

The unit is resting on its left side with the front panel to the right. One of the compartment covers, standing at the right, illustrates the screened openings that provide ventilation. Details of the arrangement of the components are given in the text.

To provide ventilation for the tubes which are placed at the rear of the shielding compartments, each compartment is provided with an opening near the bottom of the rear wall and another at the rear end of the top cover. A piece of copper screening is placed over each opening. One of these openings may be seen in the cover which appears alongside the unit in an illustration. The free circulation provided by these openings is sufficient to prevent the tubes from running abnormally hot when they are delivering their rated output. However, by placing a fan behind the opening at the lower rear and forcing a stream of air into the compartment and out through the top opening, it is possible to run the tubes even cooler than they would normally run in the open air. At present this transmitter is operated with a small fan to cool just the oscillator compartment, the fan motor being provided with a rheostat to vary the speed. By properly adjusting this rheostat it is possible to keep the temperature so constant that there is practically no frequency drift.[2] When the transmitter is used for intermittent communication the filaments are left running continually and the fan is controlled by a relay which starts and stops it with the starting and stopping of the oscillator. In this manner the tube temperature is kept practically at that established by the heating of the filament.

The illustration of the unit resting on its left side with the front panel at the right gives an idea of the disposition of the various pieces of apparatus within the shielding compartments. As viewed with the set on its side, at the bottom is the compartment containing the crystal oscillator and frequency doubler stages. The crystal oscillator occupies the lower half of the compartment and the frequency doubler the upper half. The tank inductors, near the center of the compartment, are placed one above the other in such a manner that their axes are at right angles. They plug into mountings which are supported on the side of the compartment. The tank capacitors are also located one above the other but are supported from the front panel by means of fiber insulating rods. They are connected to their dials by means of ¾-inch diameter fiber shafts.

The oscillator and buffer amplifier stages, in the middle and upper compartments respectively, have their tank capacitors at the bottom of the compartments with their inductors fastened rigidly to and directly above them. The capacitors are supported from the bottom of the compartments by means of fiber posts and are connected to the operating dial by means of fiber shafts similar to those in the first compartment. The oscillator tank inductor is mounted so that its axis is at an angle of 45 degrees with the axis of the shaft which operates the fine frequency adjustment loop. By mounting the latter also with its axis at an angle of 45 degrees to its shaft, the coupling between the loop and the tank inductor varies from maximum to minimum while the operating dial is rotating over an arc of 180 degrees.

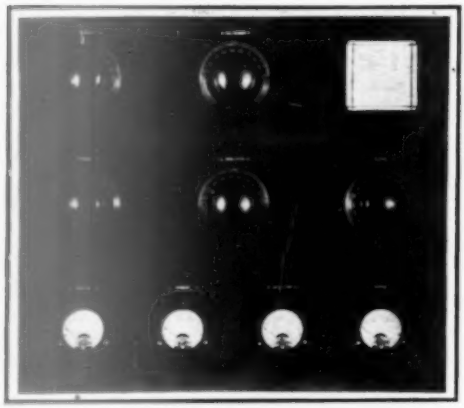
The oscillator stage neutralizing capacitor, with the grid capacitor plugged across it, is at the rear of the central or oscillator compartment, with its dial on the outside at the upper rear of the compartment. The location of this capacitor and its dial at the rear of the compartment is the only possible arrangement which does not unduly mix the neutralizing circuit with the rest of the circuit or require the complicated mechanical arrangement necessary to operate it from the front panel, since the fine frequency adjustment control occupies the only space that otherwise might be available on the front panel. It may seem an inconvenient arrangement to have a dial at the rear, but if a small mirror is fastened just behind and above the dial index it may be ob-

[2] Hull, "A Medium-Powered Oscillator-Amplifier Transmitter," *QST*, March, 1931.

served readily while it is being operated by reaching over the top of the unit.

All of the equipment mounted within the compartments is insulated from the shielding by bakelite strip and fiber rod supports. This permits the shielding compartments and the low side of the circuit to be grounded independently.

The framework which supports the baseboard



PANEL VIEW OF THE EXCITER UNIT

Placing the meters at the bottom of the panel simplifies the internal arrangement. From left to right, the lower dials are for tuning the crystal oscillator, the 75-watt oscillator and buffer amplifier stages. The dial at the upper left is for tuning the frequency-doubler tank. The fine frequency adjustment, essential in the transmission of standard frequency signals, is operated by the dial at the upper center. Tuning adjustments frequently used are noted on cards that slip into the holder at the upper right.

on which the shielding compartments are mounted also forms a space underneath the compartments which is 6½ inches high, 24 inches wide, and 18 inches deep. The front of this space is covered by the lower section of the front panel on which are mounted the four plate milliammeters. The rear of this space is covered by another panel on which are mounted the grid and screen current milliammeter jacks and all the binding posts to which the power supply circuits are connected. On this panel there are also two pairs of small jacks which are connected across the respective 7.5- and 10-volt filament circuits and into which voltmeter cord plugs may be fitted to check the filaments. Both sides of this space are open in order to provide good ventilation for the filament resistors and voltage dividers which are located there.

This mechanical arrangement, with the meters, jacks, binding posts and resistor units below the shielded radio frequency circuits, greatly simplifies the wiring of the power supply circuits within the unit. The wires connect directly from the binding posts on the rear panel to the proper jacks, resistor units, and meters, and then pass through holes in the bottoms of the shield compartments directly to the proper points on the radio frequency circuits. This lack of complicated wiring is strikingly evident in the bottom view which shows all the power circuit wiring for the four radio frequency stages It is to be noted that each grid, screen-grid, and plate supply circuit is provided with either an individual meter or a meter jack to read the current flowing. Incidentally, if the meters were mounted at the top of the front panel with jacks also on the front panel, as is a common practice, the wiring would be much more involved.

The schematic circuit of the unit is given in Fig. 1. At the left of the diagram there is indicated the crystal oscillator which employs a 7.5-watt Type '10 tube. This is followed by the amplifier or frequency doubler which also employs a 7.5-watt tube, either Type '10 or Type '65. These two stages are contained in a separate shielding compartment but have no shielding between each other. Next comes a stage employing a 75-watt Type '52 tube, which is used as an amplifier or frequency doubler when the transmitter is crystal controlled, or as a Hartley oscillator when the transmitter is self-controlled. It is contained in a separate shielding compartment. Following this is an amplifier stage employing a 75-watt screen-grid tube, Type '60, which acts as a buffer amplifier when the unit is used to excite a power amplifier or as the output amplifier when the unit is used alone. It also is contained in a separate shielding compartment.

THE CRYSTAL OSCILLATOR AND FREQUENCY DOUBLER

The crystal oscillator has its input or grid circuit fitted with a pair of small jacks, J_9 in Fig. 1, into which a mounted quartz crystal, CX, is plugged. These jacks are mounted on a small piece of bakelite which is fastened over an opening in the left side of the shielding compartment and are of such construction that the plugs which fit them may be inserted from either end. This permits the crystal mounting to be plugged into the jacks from either the inside or the outside of the compartment and gives a choice of two operating temperatures for the crystal, as the temperature within the compartment is usually higher than that of the room outside. The compartment may be cooled by a fan, however, as has been explained. An external temperature controlled crystal also can be used with the unit.

The stage following the crystal oscillator is arranged so that either a three- or a four-element tube may be used, the proper connections for the tube selected being made by means of the plugs P_1 and P_2. When the stage is used as a frequency doubler either type tube may be used with about equal output. When the stage is used as a straight amplifier it is necessary to use the Type '65 screen-grid tube since no neutralizing circuit, which would be necessary for the three-

element tube, is provided. This stage is referred to as the frequency doubler, even though it is sometimes used as a straight amplifier.

The tank circuits of both these stages are identical. The inductors L_1 and L_2 are wound with solid No. 12 enamelled wire such as is generally used for antennas. The turns are spaced the diameter of the wire and are supported by three celluloid strips to which the turns are fastened by means of cement. The coils are clamped between two strips of $\frac{3}{16}$-inch by $\frac{1}{2}$-inch bakelite. To the outside strip are fastened small plugs which fit into jacks that are connected to the circuit. These coils are, therefore, readily interchangeable. The crystal tank inductor is made plug-in so that a large inductor may be substituted for the nominal 3500-kc. one in case it is desired to use a crystal having a fundamental frequency in the vicinity of 1750 kc. or some other widely different value. The doubler tank inductor was necessarily made interchangeable because it must operate in either the vicinity of 3500 or 7000 kc. The tuning capacitors C_1 and C_2 have a maximum of 230 $\mu\mu$fd. and their plates are widely spaced to avoid any possibility of flashover.

The coupling between these stages consists of a tap on the crystal oscillator tank inductor, L_1, which connects to the grid of the succeeding stage through the 100-$\mu\mu$fd. coupling capacitor, C_{15}.

Grid bias for these stages is shunt fed through the radio-frequency chokes F_1 and F_2. The plate power is series fed via the radio frequency chokes F_5 and F_6 and across the blocking capacitors C_5 and C_6. When the Type '65 tube is used the screen-grid power is supplied via the radio frequency choke F_9, across the by-pass C_9.

THE SELF-CONTROLLED OSCILLATOR

This stage was primarily designed as a variable frequency oscillator for use in transmitting the standard frequency signals. Since this service requires an oscillator which has very good inherent frequency stability, the Type '52 tube was chosen because it is well adapted to work with a high-C type of circuit and because only a small portion of its rated output — about 20 to 30 percent, depending on the operating frequency — is required to excite the stage which follows it. These are operating conditions which assist materially in obtaining the required frequency stability. This stage is referred to as the oscillator, although it is sometimes used as a straight amplifier or as a frequency doubler. The tank circuit inductors (L_3) for all frequencies are wound with $\frac{3}{8}$-inch copper tubing. This was done so that they will not heat excessively because of the heavy currents

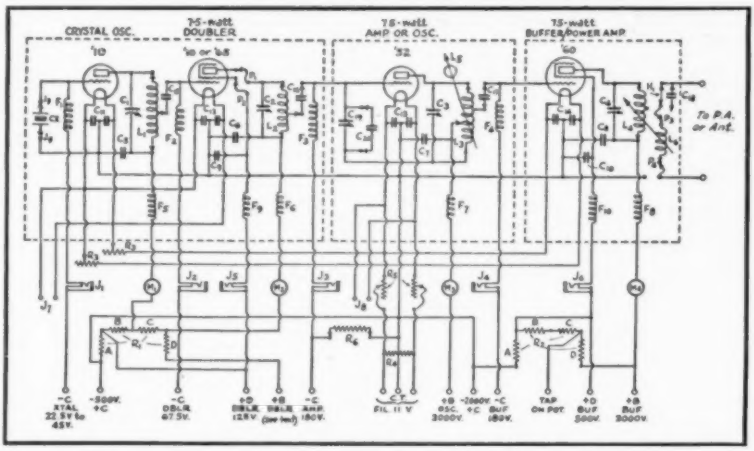
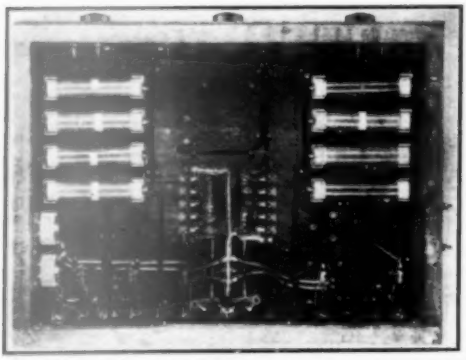


FIG. 1 — SCHEMATIC CIRCUIT OF THE EXCITER UNIT

L_1 to L_3 — See inductor table.
L_4 — Single closed turn of ¼-inch copper tubing, 2-inch diameter. See text for details.
L_6 — Power amplifier grid or antenna coupling inductor, 6 turns ¼-inch copper tubing, 3⅜-inch diameter.
C_1, C_2, C_4 — 230-$\mu\mu$fd., 3000-volt National Type TM 230 tuning condensers, Crolite insulation.
C_3 — 450-$\mu\mu$fd., same type as above.
C_5 to C_8 — .002-μfd. 5000-volt mica fixed capacitors.
C_9 — .001-μfd. receiving type mica fixed capacitor.
C_{10} — Same as C_5.
C_{11} to C_{14} — Filament by-pass capacitors, .01 μfd. mica receiving type.
C_{15} — 100-$\mu\mu$fd. 5000-volt fixed mica coupling capacitor.
C_{16} to C_{18} — .002-μfd. 5000-volt fixed mica coupling capacitor.
C_{19} — 15-$\mu\mu$fd. 6000-volt neutralizing capacitor, same type as C_1.
C_{20} — 500-$\mu\mu$fd. 5000-volt fixed mica grid capacitor. Used only when stage is operated as self-controlled oscillator.
F_1 to F_{10} — R.f. chokes. Detailed description in Part II.
R_1 — Voltage divider for low-power stages. A, B and C, 5000 ohms each; D, used only with 2000-volt supply, 20,000 ohms.
R_2 — Voltage divider for medium-power stages. A, 25,000 ohms; B and C, 15,000 ohms each; D, 5000 ohms.
R_3 — .5-ohm, 3.5-amp. filament rheostats, G. R. Type 410.
R_4 — Filament center-tap resistors, 100-ohm Carter Type A-100.
R_5 — Main filament circuit resistors, .15-ohm each; Ward-Leonard special type.
R_6 — Oscillator stage grid leak, two 20,000-ohm units in series. Used only when stage is operated as self-controlled oscillator.
J_1 to J_6 — Milliammeter jacks, closed-circuit type.
J_7, J_8 — G. R. Type 274-J jacks for filament voltmeter connection.
J_9 — Crystal mounting jacks, same as above.
M_1 — 0-50 d.c. milliammeter.
M_2 — 0-100 d.c. milliammeter.
M_3, M_4 — 0-300 d.c. milliammeters.

flowing when a large capacitance is used across them. It also makes the inductors quite rigid even though they are self supporting. The tank capacitor, C_3, has a maximum of 450 $\mu\mu$fd. and the plates are spaced so that it will not flash over at potentials up to 3000 volts.

The fine tuning adjustment device, which is only necessary when the stage is used as an oscillator, consists of a single short-circuited



IN THE BOTTOM COMPARTMENT ARE THE VOLTAGE DIVIDERS, FILAMENT AND CENTER-TAP RESISTORS, AND ALL POWER CIRCUIT WIRING FOR THE FOUR STAGES

turn or ring of ¼-inch copper tubing, 2½ inches in diameter, arranged so that the coupling to the tank circuit inductor may be varied by means of a dial on the front panel. The proximity of this turn to the tank inductor also is adjustable so that the frequency range of the fine adjustment dial can be made approximately the same regardless of the operating frequency. This permits the signal to be held to zero heat with the standard as easily at the highest as at the lowest frequency transmitted. The only loss that this method of fine frequency control entails is the heat or I^2R loss in the short-circuited turn. Since its resistance is very low this loss is negligible.

The circuit of this stage is so arranged that it may be converted readily from an oscillator to either a straight amplifier or a frequency doubler. Because the tube in this stage is a three element type, it is necessary to provide a neutralizing circuit when it is to be used as a straight amplifier. For this purpose the variable capacitor C_{19} is provided. It has a maximum capacitance of 15 $\mu\mu$fd., with its plates separated sufficiently to prevent breakdown at potentials up to 6000 volts. This high breakdown rating is necessary because the total plate-circuit plus grid-circuit voltage is across it.

In operation, the stage is first adjusted as a Hartley oscillator by finding the proper location for the filament tap on L_3. The grid capacitor C_{20}, which is fitted with plugs to connect it across C_{19}, is then removed and the capacitor C_{19}, in conjunction with the part of the tank inductor below the filament tap on L_3, forms the neutralizing circuit. The stage thus operates as an amplifier when the proper excitation is supplied, the circuit being neutralized in the usual manner. The neutralizing circuit need not be adjusted when the stage is operating as a doubler, however, and it does no harm to leave it connected; nor does the small capacitance of C_{19} across C_{20} affect operation as an oscillator. When the stage is used as an oscillator it is disconnected from the preceding amplifier by removing the plug-in coupling capacitor C_{16}.

Grid bias is shunt fed through the choke F_2, placed in the preceding shield to avoid possible stray coupling with the output circuit of the tube. When the stage is used as an oscillator its bias is obtained from the drop across a gridleak resistor, R_6, but when it is used as an amplifier the bias is supplied by batteries and the leak is disconnected.

THE BUFFER-AMPLIFIER

A Type '60 screen-grid tube is used as the buffer amplifier because it gives sufficient power output to excite the 500-watt amplifier and because it is self neutralizing. It also works satisfactorily as an output power amplifier when the unit is used as a 75-watt transmitter. This stage is referred to as the buffer-amplifier although when the unit is used alone it becomes the output power amplifier.

The coupling to the oscillator stage, from which this buffer is excited, is by means of the capacitor C_{17}, and a tap on the oscillator tank inductor L_3. The tank circuit inductors are wound with ¼-inch diameter copper tubing, even though considerably more power is handled than in the tank of the oscillator whose inductors are wound with ⅜-inch diameter tubing. This, however, is quite satisfactory because the maximum tank capacitance is only 230 $\mu\mu$fd., about one half of that of the oscillator, and consequently the circulating current is considerably less.

The output coupling scheme is such that either capacitive or inductive coupling may be used to transfer the radio frequency output to the load circuit. This arrangement is indicated at the right of the diagram (Fig. 1), the connections as shown being for inductive coupling. The coupling is made capacitive by removing the coil L_6, replacing the jumper H_1 by the coupling capacitor C_{18}, and placing the taps P_3 and P_4 in their alternate positions.

EXCITER UNIT INDUCTOR SPECIFICATIONS

No. 12 enamelled solid copper wire is used for L_1 and L_2. Three-eighth inch copper tubing is used for L_3 and quarter-inch copper tubing for L_4. L_1 and L_2 are equipped with G.R. plugs while the copper tubing inductors mount on brass angles fastened to the tank inductors, the ends of the tubing being flattened and drilled for 10/24 brass machine screws. Wing nuts facilitate rapid changing of these inductors. Corrosion of the

copper tubing is prevented by a coat of clear lacquer applied immediately after the inductors are cleaned and polished. Tap leads are soldered to the inductors after the proper positions have been determined experimentally and the free ends of these leads are connected to the circuit by spring clips. The coil details follow:

Inductor	*Freq. Band*	*No. Turns*	*Outside Diam.*	*Length*
L_1	3500 kc.	20	2⅝"	3"
L_2	3500 kc.	20	2⅝"	3"
	7000 kc.	10	2⅝"	1½"
L_3	3500 kc.	15	3⅜"	7"
	7000 kc.	7	3⅜"	4¾"
	14,000 kc.	3	3⅜"	2½"
L_4	3500 kc.	18	3⅜"	5⅝"
	7000 kc.	7	3⅜"	3⅝"
	14,000 kc.	4	3⅜"	2¼"

POWER SUPPLY

The filaments of all the tubes are lighted from a common source which can be either a d.c. generator or a 60-cycle transformer. A center-tapped resistor, R_4, is provided within the unit so that no internal connections need be altered to change from one supply to the other. Because the filaments of this unit may be operated from the same source which is supplying tubes that require 11 volts on the filament, the resistors R_5 and R_3 have been provided to drop the voltage to 10 and 7.5 as is required by the 75- and 7.5-watt tubes of this unit.

The high-voltage plate supply for all tubes may be obtained from a single source of either rectified and filtered alternating current or from a direct current generator. Either of these supplies must be able to furnish about 300 milliamperes at 2000 volts. The full 2000 volts is applied directly to the buffer stage and to the voltage divider R_2, from which the oscillator supply of 1500 volts and the buffer screen-grid supply of 500 volts are obtained. When the crystal oscillator and frequency doubler stages are being used the 2000 volts is also connected to the voltage divider R_1, which supplies these stages with the proper voltages. These stages also may be operated from a separate 500-volt supply by connecting it across the voltage divider R_1, and short circuiting the section "D" of R_1.

For the transmission of standard frequency signals from this station the generator supply is always used because the regulation of the alternating current line is too poor to permit the oscillator to be maintained at exactly "zero beat" with the standard when the rectified and filtered supply is used. The motor-generator unit operates from the same supply line but because of its mechanical inertia the irregularities in voltage are smoothed out.

The grid bias supply for this unit is obtained from a group of dry cell "B" batteries which is common to the whole unit.

Part II of this article, which will be published in September QST, will describe in detail the 500-watt screen-grid amplifier of W1XP's Standard Frequency Transmitter, disclosing interesting and useful information on such things as a method of screen-grid modulation for phone transmission, radio frequency chokes, keying methods, and more about the refinements in high-power amplifier design demanded by precision and accuracy. The dope is good for lower-powered sets, too. You will find a lot applicable to your own transmitter problems. Watch for it. — EDITOR.

Honolulu Convention

Hawaiian Section, Pacific Division, August 21st–22nd

McKINLEY High School's million-dollar plant will be the headquarters for the Hawaiian Section Convention to be held on the above dates, under the auspices of the Radio Club of McKinley High School, and the direction of L. A. Walworth, SCM for Hawaii. The Chemistry and Physics instructors have agreed to put on some unique stunts in their laboratories. The school café will serve a ham banquet in the spacious dining hall.

Fellow amateurs from everywhere are invited. The convention fee will not exceed $2.50 including the banquet. Over 90% of the Hawaii hams were present last year — let's make it 100%, fellows. L. A. Walworth, 2737 Ferdinand Ave., Honolulu, T. H.

Strays

3500-kc. DX is picking up in great style. The January issue of *New Zealand Radio* says that U. S. hams can be heard in N. Z. any evening on this band, and that several have been heard on 'phone, W6CLE, W9MM, W9AJQ and W6BB being identified. Evening in New Zealand corresponds of course to the early morning hours in this country.

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W6KX suggests a new abbreviation, QRNN, meaning man-made static, power leaks, etc. The difference between QRNN and plain QRN is that the former may let up in a short time, while the latter, when bad, usually lasts for some hours.

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British 'phone operators will be interested in the new Ediswan Type E.S. 75 tube, which is practically a counterpart of the UV-845. The tube has a plate dissipation rating of 75 watts, and an undistorted power output of 25 watts. The maximum plate voltage is 1250, and the amplification factor is 5. It should be an excellent medium-power modulator.

Adding an Amplifier to the Low-Power Transmitter

By George Grammer, Assistant Technical Editor

THE average amateur breaks into the game with a relatively low-powered transmitter as the usual thing — "low power" referring to sets using tubes of the '45 or '10 type. Results in the way of DX are often surprising considering the small amount of energy radiated, but with the exception of those fortunate few who have "ideal" locations most hams, after a year or so of low power, look around for something which will get them to the far corners of the earth — and to relatively nearby points as well — more consistently. In fact, the desire for consistency and for the ability to get through under unfavorable conditions is the only real reason for going up the power scale.

Experience has shown that there is a sort of happy medium in this power business — a level which is struck when one has an output of the order of 100 to 200 watts. Power outputs of this order are sufficiently higher than those ordinarily obtained from low-power outfits to noticeably improve the signal strength at distant points, and, conversely, an increase beyond these figures often does not bring with it a proportionate increase in results, considering the rapidity with which costs mount when one goes up toward the limit of amateur power.

The transition from low to high power — or even to a moderate amount of power — is not always easy, especially if we think in terms of the '52 as the next step after a Type '10. A '52 doesn't really buckle down to its job unless it has 2000 or more honest-to-goodness volts on its plate, and adequately rated power supply equipment for such voltages is likely to make quite a dent in the pocketbook. Since the advent of the '52 the old "50-watter" (incidentally, the rating is now 75 watts) has been forced to take a back seat, and with some reason, because the '52 is a better high-frequency tube. Yet the '03-A is not so dusty itself, as many amateurs using it will testify. It will give quite decent output on any of our three most popular bands, and does not require extremely high plate voltages to do it. It is particularly well behaved when used as a power amplifier, being comparatively easy to excite.

It is the purpose of this story to describe the construction of a power amplifier using a tube of the '03-A type, intended to be used with low-power sets which are already giving satisfactory results considering the power output. In other words, we will assume that the station is already equipped with a transmitter which has good frequency stability and an output of perhaps 15 watts or more. That set might just as well be used to excite the larger tube; in fact, it is advantageous to do so, as has been pointed out previously on these pages, because a properly-excited amplifier gives more power output than a stable self-excited oscillator running at the same input. And by using the scheme outlined in this article no changes need be made in the old set.

Before going any farther we might mention that the amplifier pictured herein was built as a companion piece to the low-power crystal set described in the July issue. It will perform equally well, however, with any normal Type '10 outfit, self-excited crystal-controlled or m.o.p.a.

CONSTRUCTION

An amplifier of this type is not difficult to build, as inspection of the photograph and Fig. 1 will show. The terminals marked "input" on the diagram are brought out to two binding posts on a small bakelite strip at the right-hand side of the breadboard, and from them connections are made to the oscillator as described later. One of these terminals goes directly to the grid post on the tube socket. The other is connected to the midpoint of the filament by-pass condensers through the by-pass condenser C_4, and is also connected to a radio-frequency choke which terminates at a binding post on a small panel on the underside of the board at the rear. The grid bias for the tube is fed in through this choke. The by-pass condensers C_2, C_3 and C_4 are all mounted below the board, as are also the two r.f. chokes.

On the output side, condenser C_1, the tank tuning condenser, is to the left of the tube socket, and behind it is the amplifier plate coil, mounted on a pair of porcelain stand-off insulators. The neutralizing condenser, C_5, is mounted on a small piece of bakelite, and is located directly in front of the tube socket. The neutralizing arrangement is quite conventional. The balancing voltage is obtained by bringing the plate voltage in at a point a few turns away from what would ordinarily be the "low-voltage" end of the tank coil, the neutralizing condenser being connected between this end of the coil and the grid of the tube. This scheme possesses the advantage that the tap on the plate coil need carry no r.f. current and therefore may be made by an ordinary clip.

The antenna coupling coil and tuning condenser

will vary in size with different antenna systems and feeder lengths, and exact specifications are therefore impossible. The antenna coil in this case is arranged to be swung through an arc near the plate coil so that the coupling can be varied.

The layout is quite straightforward, and in fact almost exactly follows the wiring diagram. This is one of the advantages of breadboard construction, because parts may be placed in positions to be preferred from a purely electrical standpoint. On the other hand there is no valid argument against using other types of construction so long as no principles of good practice are violated by so doing. In the case of an amplifier of this type the principal precaution to be observed is to separate the input and output circuits to prevent coupling between them, and to avoid mounting the plate coil in such a way that there is no metal in the intense parts of its field, i.e., at the ends of the coil.

COUPLING

The amplifier as shown in Fig. 1 may be coupled to almost any type of oscillator or low-power amplifier without the necessity for any changes in the preceding tube circuit. The idea is to use inductive coupling between the stages, and to tune the input circuit of the amplifier. For this purpose the antenna coil and condenser ordinarily used with transmitters are employed.

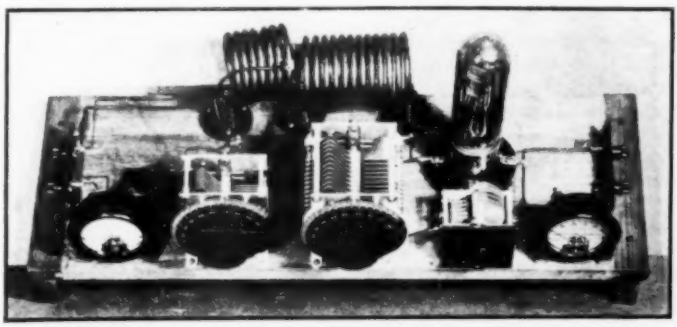
Fig. 2 shows how the unit would be coupled to a simple Type '10 Hartley transmitter, for instance. The part of the circuit to the left of the terminals marked "input" will be recognized as the same as Fig. 1, while the condenser C and inductance L may be the coil and condenser ordinarily used to couple the Type '10 Hartley outfit to the antenna. No connections are altered in the oscillator itself, nor is anything additional connected to any part of its circuit.

Although the use of this scheme means one more tuning control than is necessary with the more common capacity-coupling system, it possesses several advantages which the latter does not. First of all, the addition of the amplifier requires no changes to be made in the oscillator (or preceding amplifier, if the set is already an oscillator-amplifier job), so that this part of the set can be handled as it always has been — there is nothing new to be learned about its operation, as might be the case if direct coupling were used. Again, the amplifier excitation is readily varied by changing the coupling between the oscillator tank and the coupling coil, L, or by adjusting the setting of condenser C. In addition, it allows the use of an L-C ratio in the grid circuit of the amplifier more favorable to correct excitation than might be possible with direct coupling. And last but not least, the bias voltage may be fed to the grid of the amplifier in series with the tuned circuit, thus greatly lessening the work of the grid r.f. choke and relieving the condenser C_4 from withstanding any voltage except the bias voltage, which is usually well below the insulation capabilities of the condenser. It will be remembered that in the usual form of capacity coupling this condenser is at a point of high r.f. voltage in the circuit, and that in series-fed oscillator or amplifier circuits it has to stand the plate voltage on the preceding tube as well as the bias voltage on the amplifier.

ADJUSTMENTS

The adjustment and neutralization of this type of amplifier circuit differ in only a few points from the procedure followed with other circuits. First get the oscillator running on the desired frequency and light the filament of the '03-A. The grid and plate return circuits of the amplifier should be closed: that is, the positive side of the "C" battery and the negative side of the plate supply should be connected directly to the center-tap of the filament transformer. The amplifier plate supply should be turned off, however. The clip on the amplifier tank coil should be placed on a turn about a third of the way up from the neutralizing condenser end, and the latter condenser may be left at some random setting.

Next set the tap on L at some point which looks as though it should allow tuning the C-L circuit to the same frequency as the oscillator. Couple L to the oscillator tank coil, using about the same degree of coupling as is ordinarily used when tuning the antenna to the oscillator, and vary C until resonance is obtained. Resonance



THE AMPLIFIER IN TYPICAL BREADBOARD CONSTRUCTION

The breadboard allows the use of a logical layout, and makes constructional work easy. The placing and functions of the various parts are explained in the text.

will be indicated by a sharp rise in oscillator plate current. If it is impossible to hit resonance, try the tap on L at different positions until the right combination is found. An amateur with even a small amount of transmitting experience will have little difficulty in judging the amount of inductance required at L to work in the various

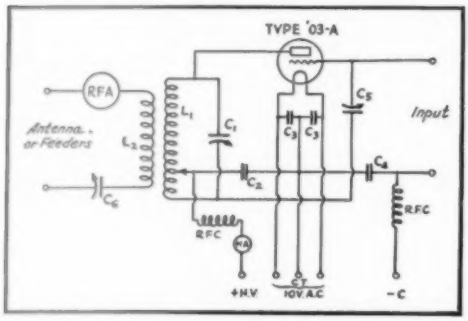


FIG. 1. — THE AMPLIFIER CIRCUIT

C_1 — 250 μμfd. transmitting condenser.
C_2 — .002 μfd. or larger mica by-pass condenser, 5000-volt rating.
C_3 — .004 μfd.
C_4 — .002 μfd.
C_5 — 100-μμfd. condenser, transmitting type.
C_6 — 250–500 μμfd. variable.
L_1 — 3500 kc. — 12 turns of ¼-inch copper tubing, 5-inch diameter.
7000 kc. — 12 turns of ¼-inch copper tubing, 2½-inch diameter.
14,000 kc. — 5 turns of ¼-inch copper tubing, 2½-inch diameter.
All three coils made with turns spaced to make total length 4½ inches.
L_2 — 7 turns of ¼-inch copper tubing, 2½-inch diameter.
RFC — "Compromise" chokes, consisting of a three-inch winding of No. 32 d.s.c. on half-inch form.
MA — 0–500 d.c. milliammeter.
RFA — 0–4 thermo-couple ammeter.

bands. Once the resonance point is found, loosen the coupling between the two coils, making simultaneous small adjustments to C to keep the tuning right, until the oscillator is drawing about the same plate current as when working into the antenna. If the coupling is too loose to make the oscillator draw normal plate current in the beginning, the coupling should be tightened, of course. Since this series of adjustments is quite likely to affect the frequency of the oscillator to some extent, the frequency should be constantly checked in a monitor and such readjustments made as may be necessary to keep the frequency on the same spot.

At this stage of the game a neon lamp will be found helpful. It should be touched to the grid of the amplifier tube, and should show a pronounced glow, indicating that r.f. is getting to the tube.

NEUTRALIZING

The amplifier tank condenser, C_1, should now be varied slowly through its range until the amplifier tank circuit is tuned to the same frequency as the oscillator. Unless the tube is by some accident of adjustment completely neutralized, resonance will be indicated by a bright glow from the neon lamp when touched to the plate end of the tank coil. A flashlight lamp and loop of wire coupled to the plate (not neutralizing) end of the tank coil will also make a satisfactory resonance indicator. Parenthetically, in making neutralizing adjustments it is always well to avoid coupling the resonance indicator to the neutralizing circuit itself. The slight amount of detuning introduced is enough to throw the neutralizing off when the resonance indicator is removed.

The neutralizing process is next followed through as usual; that is, C_5 is varied until a point is found where there is no indication of r.f. on the amplifier plate tank for any setting of C_1. This, by the way, should be done with the antenna or feeders disconnected from the amplifier, because it is within range of possibility that the antenna circuit could be near enough to resonance to take power from the amplifier tank and thus give some misleading results.

Since adjustment of the neutralizing condenser may affect to some extent the tuning of the amplifier grid circuit, note should be made of the reading of the oscillator plate meter to make sure that the L-C circuit is taking load properly. If the plate current has changed during the neutralizing process, condenser C should be readjusted to bring it back to normal.

It is well to remark at this point that when using series feed on the plate and neutralizing as shown in the diagrams the capacity of condenser C_2 is of some importance. If C_2 is too small it may be impossible to secure complete neutralization. Some experiments have indicated that unless C_2 is at least .002 μfd. complete neutralization is difficult, if not impossible, at the frequencies ordinarily used by amateurs. It is best to make it plenty large, providing the condenser is non-inductive. The ordinary mica blocking condensers are satisfactory in this respect, but beware of wound paper condensers. The mica condensers are the better bet to hold up under the plate voltage, so that few will be tempted to use paper condensers. Under some conditions there may be apparent neutralization when the plate supply circuit is open but it may be impossible to completely neutralize with the plate circuit closed. (Incidentally, the plate circuit is not really closed, even though all the connections have been made, unless the filaments of the rectifier tubes are lighted.) In such a case the only remedy is to use a larger condenser at C_2, since the plate circuit is closed under actual working conditions — the conditions for which we neutralize.

Once the amplifier is neutralized the final adjustments may be made to the grid circuit. In general it is best to use as much inductance and as little capacity as possible in the circuit

formed by C and L, in order to build up the highest possible voltage on the amplifier grid. The higher the exciting voltage the greater will be the output, within limits, and the better will be the efficiency. The clip on L should be so placed that there will be just enough of C in the circuit to allow tuning in and out of resonance on both sides. Finally, after getting the L-C ratio properly adjusted, re-check the neutralizing. The set is then ready to go.

The bias voltage for the '03-A should be approximately 90 volts. This is sufficient to cut off plate current completely when the excitation is removed, even though with a nominal "1000-volt" plate supply the actual voltage may build up to 1400 or so when no plate current is drawn.

The plate condenser, C_1, should be set as nearly as possible to resonance before excitation is applied; otherwise the plate current is likely to be abnormally high. The resonance point can be gauged with fair accuracy during the neutralizing adjustments. Excitation should then be applied and final adjustment of C_1 made for minimum plate current. Usually this will be somewhere between 20 and 50 milliamperes. The antenna may then be coupled and tuned in the usual way until the tube draws rated plate current, and the set is ready for regular use. Slight readjustments all the way through may result in somewhat better output.

Although the process of getting tuned up may look rather formidable on paper, the difficulties are really less than might appear, provided no unanticipated troubles are encountered. There should be none of these if the amplifier is properly neutralized.

The key may occupy any of the ordinary positions usually assigned to keying. If the exciting tube is a self-controlled oscillator and the key is in the center tap of the amplifier the oscillator frequency may shift somewhat as the key is opened or closed. Should this be annoying the key may be removed from the center tap and placed in the amplifier negative high voltage lead. Either of these systems presupposes that the oscillator is to run continuously.

With the oscillator running continuously an undesirable slow drift of frequency may be encountered. The oscillator itself may have given no trouble in this respect when keyed previously, so that the obvious thing to do in such a case is to key the oscillator as before. With 90 volts bias on the '03-A the plate current will cut off completely whenever the key in the oscillator circuit is open, so that the keying is positive with this system. This method of keying is particularly recommended if the exciting tube is itself an amplifier, such for instance as the Type '10 tube in the transmitter described in July *QST*. It was used in testing this outfit and seemed to be free from clicks and thumps, even though no thump filter was used on the small set. It cannot be guaranteed to work out that way in all cases, however.

If in keying the exciting tube, as described above, the plate current of the amplifier does not go to zero each time the key is opened, it is a fairly certain indication that the amplifier is not properly neutralized. This happened to us in the preliminary testing and led to the conclusions about the amplifier plate by-pass condenser capacity mentioned previously. Complete neutralization effected a permanent cure.

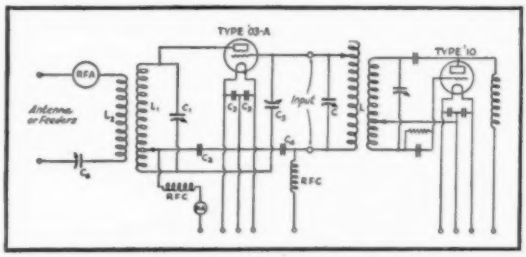


FIG. 2 — HOW THE AMPLIFIER IS COUPLED TO THE PRECEDING TUBE

In this case a Hartley oscillator is assumed to be supplying excitation to the amplifier. A tuned circuit is used in the grid circuit of the amplifier, and is coupled inductively to the oscillator. Any other type of oscillator or low-power amplifier may be coupled in the same manner.

OUTPUT

The output obtainable will be determined largely by the amount of excitation supplied to the grid of the amplifier and the accuracy of tuning. Some tests were made with a dummy antenna and it was found that outputs as high as 150 watts on 3500 and 7000 kc. with 1000 volts on the plate could be obtained without unduly "pushing" the tube. The input was roughly 225 watts. On 14,000 kc. the efficiency drops off somewhat, but it is not at all difficult to get 100 watts or so. These outputs were obtained with inputs to the preceding tube of the order of 25 to 30 watts — quite reasonable for a Type '10 tube — so that they represent nothing abnormal.

If the amplifier is to be used following the set described in July *QST*, coupling coils to be plugged into the antenna coil socket may be made approximately as follows: For 3500 kc., 10 turns of No. 14 antenna wire on a 2½-inch bakelite tube, spaced approximately 1/16 inch between turns; for 7000 kc., 5 turns with 3/16-inch spacing; for 14,000 kc., 3 turns with half-inch spacing. These are necessarily smaller than the corresponding plate coils for the Type '10 amplifier because of the comparatively large input capacity of the '03-A. Some experimenting with coil sizes may be beneficial. In general, the greater the inductance the better

(Continued on page 30)

Why Not Frequency Tripling?

By Boyd Phelps, W2BP*

FOR those desiring powerful 14-megacycle crystal-controlled signals with a minimum of stages it is recommended they try a 4700-kc. (63-meter) crystal followed by a single tripling stage instead of the customary two doublers. Tripling may have been overlooked by amateurs but almost as good efficiency can be obtained (35%) as with doubling (45%), the plate circuit being out of resonance with the grid in either case.

If the recommended changes in radiophone frequencies become effective this suggestion may be useful for a large number of c.w. men now having crystals in the 3900- to 4000-kc. band that may be ground a bit more, or for phone men who will find their crystal tank circuit will easily cover the 4000- to 4700-kc. range to work in either band with a crystal in that range or the 3900- to 4000-kc. on the 14,150- to 14,250-kc. phone band by tripling from a crystal in the 4700-kc. range. Somewhere around 4000 kc. is where crystals give their maximum power but the thin crystals for 7000 kc. are quite fragile and should not be forced to give much power. In our experience, 4700-kc. crystals have been regularly used with a 211-D oscillator drawing 150 milliamperes at 400 volts and delivering about 35 watts, exciting a buffer-tripler '52 stage giving about the same output on 14-mc. — which is ample to excite a husky final stage.

Old warnings about frequency doubling in the final stage of a transmitter hold for tripling and there is especially likely to be radiated considerable fundamental frequency power with Zepp, third harmonic, or other radiating systems having a wire ¾-wavelength long that would tend to increase the strength of the 4700-kc. signal, which would not be in any amateur band. A straight final amplifier between the tripler and antenna, as in doubling, should always be used and of course gives much greater output.

For those desiring to lap down their own crystals the following dimensions are given as a guide. A micrometer, a piece of broken automobile glass, some valve grinding compound, water, a rag, and a *Handbook* or back issues of *QST* are needed. One flat side of the blank should be left untouched for reference and the thickness kept the same within .0002" variation all over.

These figures are only for the X-cut (thick-cut, Curie-cut, perpendicular-cut, etc.) crystals. If the blank is of the Y-cut its thickness already is about .0192" at 4000 kc. and perhaps had better not be ground more unless you are experienced.

* Box 247, Hicksville, L. I., N. Y.

Before going on the air, more precise measurements of the resulting frequency should be made by means of a monitor or heterodyne frequency meter calibrated from standard frequency transmissions. Here are the figures:

Fundamental Frequency, kc.	*Safety Triples to (kc.)*	*Thickness (inches)*
3900	.....	.0289
4000	.....	.0282
4666.6	14,000	.0242
4716.7	14,150.1	.0239
4750	14,250	.0237
4800	14,400	.0235

Adjusting a tripler stage is no more complicated than adjusting a doubler and is simpler than a straight amplifier because it does not need to be neutralized. The tank circuit is tuned to three times the frequency of the grid excitation and resonance may be noted by various means such as a radio frequency tank circuit ammeter, grid milliammeter in following stage, plate milliammeter in following stage etc. The last method involves only a plate meter which would no doubt be used in any case.

Amateurs working on only 3500 and 7000 kc. with a crystal controlled transmitter that lacks space for two doublers may find the above suggestions useful in extending their working range to 14,000 kc., for tripling makes this possible with the same tube line-up and one additional crystal. Let us hope it helps to improve a few signals on this band.

Adding an Amplifier to the Low-Power Transmitter

(*Continued from page 29*)

will be the operation. With this transmitter the antenna condenser should be shunted directly across the coupling coil and connections made as shown in Fig. 2. The r.f. ammeter may be cut out of the circuit or short-circuited. It should *never* be left in the closed circuit formed by the coupling coil and antenna condenser. This is almost sure to result in burn-out of the meter. It may, however, be placed in series with the grid of the amplifier tube provided the r.f. grid current does not exceed the range of the meter. It is best to use a shunt across it in preliminary testing.

Strays

Seen by WSOK on a sign in his town: "Blank Battery & Magneto Co. Amateurs Rewound."

What Is This Thing Called Decibel?

An Amateur View of the Transmission Unit

By James L. McLaughlin* and James J. Lamb, Technical Editor

ANYONE who makes a practice of at least skimming through the technical literature of radio cannot have escaped noticing the increasingly frequent occurrence of "db" peppering its pages. Once pretty much restricted to papers and articles involving only telephony and broadcasting, it is now quite usual to find "db" popping up in technical stories which have little or no connection with wire telephony and often having but incidental relationship with telephony of any kind. Comparisons of the relative strengths of c.w. signals and the directivity of antennas, for instance, are surprisingly satisfying and meaningful when described simply in terms of decibels. And when something becomes satisfying and meaningful for the description of c.w. signals and the relative merits of antennas it becomes *pronto* one of those things that amateurs welcome to their circle and must needs adopt. True enough, amateurs in considerable numbers do have a friendly working acquaintance with the db; and its appearance in *QST*'s pages is by this time no novelty.[1] But it must be acknowledged that an aroma of mystery and the undeserved taint of "too technical" have become attached to the poor decibel, seriously handicapping its wholehearted adoption by many who have genuine use for it as a simplification in the handling of things radio — especially in the amateur field. Hence this little story; an attempt to do right by our little decibel and send it on its merry way to popularity with the ham of the species.

HOW THE DB CAME TO BE

So far we have not so much as intimated what the family origin of our subject might be. For purposes of getting acquainted this matter is, of course, of some importance, even though we know that the origins of electrical measuring units are soon forgotten in the process of putting them to work on practical problems. Witness the general acceptance of the volt, the ampere, the watt, the ohm, as practical yardsticks for our radio measurements, with never a thought to their fundamental derivation. In fact, they have for us an almost physical reality — just as pints and quarts have to folks in other lines of more or less scientific endeavor. And so it is with the decibel. To hear those of the inner circle glibly bandy "db up" and "db down" is to marvel at the facility with which we technical people can take terms that have nothing more solid than abstract mathematical ratios as their basis and adopt them as genuine realities. That is what we have done with every one of our electrical terms (who doesn't think of a 75-watter as having genuine physical dimensions?) and that is what we cannot help but do with the decibel. For just as the ohm is based on nothing more real than a mathematical ratio between volts and amperes, so the decibel is based on a mathematical ratio between power values. It differs slightly from other ratios in that it is logarithmic, which may seem discouraging but shouldn't, and it actually has a genuine physical meaning not possessed by most electrical units of measurement; it places power ratio and sound sensation as detected by the ear on a common basis. We "hear logarithmically"; our ears do not detect equal steps of loudness for equal steps in the power of sound but detect equal steps in a scale of loudness more nearly as equal steps in a *logarithmic* scale of sound power ratios. All of which may appear somewhat far-fetched and remote from the measurement of signal strengths and of antenna efficiencies until we recollect that amateur systems of communication invariably introduce the ear as the final piece of equipment; and that unqualified measurements in terms of volts, amperes, watts, and such do not fit the peculiarities of our personal listening apparatus.

WHEN IT STARTED

In the early development of telephony, a systematic relationship of electrical power ratio to sound sensation soon became necessary. To the telephone engineer, and to the radio engineer as well, sound is a commodity to be transformed and transported from producer to consumer through a transmitting medium. In the early days of electrical communication the medium was essentially a circuit of wire, but this has been extended more lately to include also radio circuits through space. Be the circuit wire or spatial, every piece of equipment in it between the source and a distant point means either a gain or loss in power level which must be translated to terms of sound value. Once upon a time different values in power level were simply but crudely specified as "a little louder," "not so loud," and so on — not even so exact as our old amateur "R" system of describing signal strength.

* Aviation Radio Station, Inc., 29 West 57th St., New York City.

[1] Particularly "Some More About the Family," Chamberlain, *QST*, July, 1928; and subsequent articles on volume level indicators, directive antennas, etc.

In search for a measuring unit for expressing more definitely different values of power level in terms of sound value, the resourceful telephone people hit upon the idea of the "standard cable mile." This unit of power ratio was equivalent to the transmission loss of one mile of standard No. 19 telephone cable having a resistance of 88 ohms per loop mile and a capacity of .054 μfd. per mile. Of course telephone engineers could not be eternally lugging cumbersome reels of this cable around with them, and compact artificial cables containing lumped resistance and capacity were used as a necessary convenience.

Now the "mile" unit had two characteristics, one good and the other not so good. The good one was that for speech the transmission loss of a

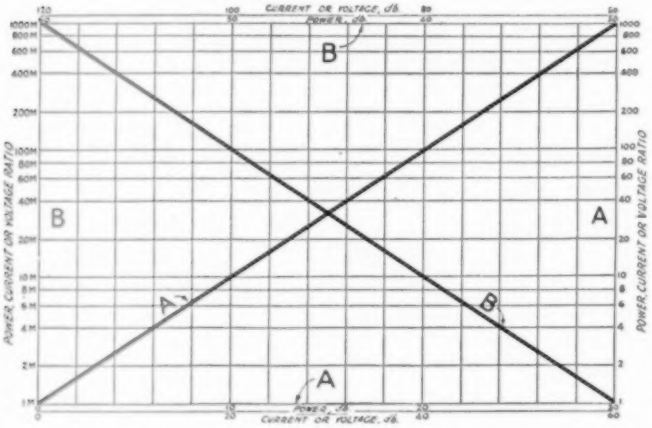


FIG. 1 — THE GRAPHICAL "GAIN" TABLE

Coördinates marked "A" are used for the "A" curve and those marked "B" go with the "B" curve. Instructions for making up the curves and suggestions for their use are given in the text.

"mile" quite closely represented the smallest step on a loudness scale that the ear could detect; the bad one was that it had a vicious frequency characteristic. It attenuated higher frequencies more than it attenuated the lower frequencies. It was not distortionless. This was not so serious where only "talking" tests had to be made, but when it came to making accurate measurements at single frequencies the thing became nearly meaningless. This was helped somewhat by adopting a standard frequency representative of speech, this frequency being first chosen as 800 cycles and later as 1000 cycles. Of course there was a lot more than this to the first epoch of power level measurement history, but this abridged version will suffice to bring us to the modern era. It does indicate, however, that the development of a completely satisfactory unit of power level measurement is not something that might occur accidentally along about the 37th CQ on a crowded Saturday night.

ENTER THE DECIBEL

As soon as the "mile" became so obviously unsati-factory for the advancing art of electrical communication, the ever ingenious telephone engineers went gunning for a better unit which would not be greatly different in value from the old unit at speech frequencies, but which at the same time would be distortionless and hence more generally useful. This unit was not derived by the cut-and-try method which brought about the "mile," but originated on a slightly higher plane. It was born more through mathematical evolution, the process being best shown, perhaps, by a general example.

Suppose we have a uniform signaling circuit (telephone or radio) having a length of n miles and suppose that the power at the input end of this circuit has a value of P_1. Suppose we next measure the power at a point 1 mile from the source and designate this power value as P_2. The ratio r of the two power values is P_1/P_2. Continuing the process, let us measure the power values at successive points each 1 mile further from the source. The successive power ratios will be found to be r^2, r^3, r^4, etc., the ratio for a point n miles from the first point being r^n. Very clearly, the power ratio is an exponential function of the length of the circuit. Coincidentally, it will be found that the sound level is directly proportional to the loop length of the line and hence to the exponential power ratio. Now let us put this power ratio in the form of a general equation:

$$\frac{P_1}{P_2} = r^n$$

THIS LOGARITHMIC BUSINESS

Now what we are after is the value of the exponent n as derived from the ratio of the two power values. Recalling what we may have forgotten about such things, or digging out the old "math" book if we can't recall it, we find that this exponential relation may be put in logarithmic form, equating the exponent to the other terms:

$$n = \log_r \frac{P_1}{P_2}$$

We are closer to the working version of the thing by this time, except for assigning a numerical value to r in the "log to the base r" part of it. Again going back to our school-day "math," we re-discover that there are two systems of logarithms in general use: The Naperian system in

which the base, designated e, is 2.71828; and the Briggs, decimal, or common, system in which the base is an even 10. Both of these systems are used for expressing logarithmic power ratios, the Naperian system giving a basic unit called the "neper" and the decimal system giving a basic unit called the "bel." Our decibel is a subdivision of the latter and the base 10 is therefore the one for us. Now our logarithmic power ratio equation looks like this:

$$n = log_{10}\frac{P_1}{P_2} \text{ bels}$$

Since it happens that the *bel* is too large a unit for practical work and since the old "mile" unit is approximately equivalent to a unit one-tenth the size of the *bel*, we divide the right-hand side of the above equation by one-tenth and obtain the expression for logarithmic power ratio in decibels:

$$n = 10\ log_{10}\frac{P_1}{P_2}\ db$$

The two power values must be in the same units (kilowatts, watts, milliwatts, microwatts — or horse power). If the ratio of the two power values is greater than unity there is positive gain and if the ratio is less than unity there is negative gain or loss. A ratio of unity of course gives zero gain.

Since it is usually more convenient to measure voltage or current values than it is to measure the power directly, when the power is proportionate to the square of the current or voltage, as in a circuit of pure resistance,

$$n = 10\ log_{10}\frac{I_1^2R}{I_2^2R}\ db$$

$$= 20\ log_{10}\frac{I_1}{I_2}\ db$$

Likewise,

$$n = 20\ log_{10}\frac{E_1}{E_2}\ db$$

Strictly these relations hold only so long as the circuit conditions are the same for the two measurements of either current or voltage. As has been pointed out in a previous publication[2] a correction must be applied where the conditions are different for the two measurements. This will work no hardship in most cases, however, especially where we are concerned with changes in power level at only one point in a circuit. This will be generally true in amateur problems.

[2] "Notes on Power Measurements in Communication Circuits," Crawford, *General Radio Experimenter*, October, 1929.

Because of the logarithmic character of the decibel, successive gains and losses expressed in db are added algebraically. For instance, suppose we have a system containing successively an amplifier giving a positive gain of 20 db, a line having a negative gain (loss) of 5 db, an impedance-matching network giving a negative gain (loss) of 30 db, and ending up with an amplifier contributing a positive gain of 10 db. The overall gain of the system, from the input of the first amplifier to the output of the terminating amplifier, would be +20db −5db −30db +10db = −5db. This feature in itself contributes considerably to the simplification of power level calculations where there are a number of pieces of equipment between the input and output terminals of a system. Once the gain for each piece of equipment is known, providing the couplings have proper characteristics, it is necessary only to perform a simple addition to determine the gain for the whole system.

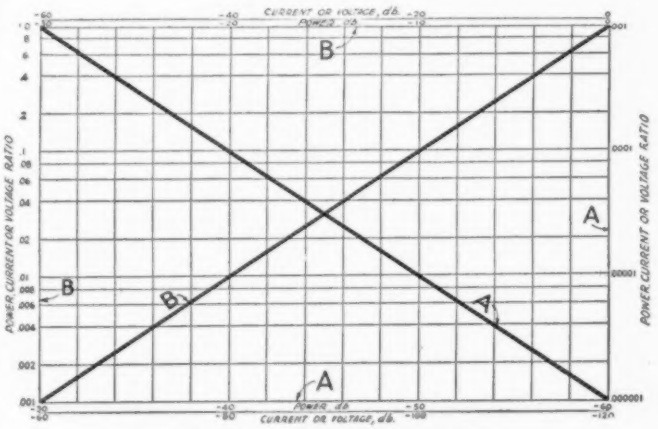


FIG. 2 — THE "LOSS" TABLE

ELIMINATING THE MATH

Now that we have dutifully traced the mathematical evolution of the decibel — we trust it has been followed just as dutifully — the time has come to disclose the inevitable short cut which eliminates the mathematical computations involving log tables, slide rules, and such. The method is graphical and employs another mathematical trick. Using "semi-logarithmic" graph sheets on which the ordinates form a geometric progression while the abscissae form an arithmetical progression, power and current or voltage ratios are plotted against db values, the resultant curve being a straight line. Figs. 1 and 2 illustrate such graphical tables covering power ratios from one one-millionth to a million with corresponding db values of from −60 to +60. They also cover voltage or current ratios of from one

one-millionth to one million with corresponding db values of from −120 to +120. These ranges are adequate for all practical purposes since it is quite unusual to encounter gains or losses greater than these values. Since the graphical tables

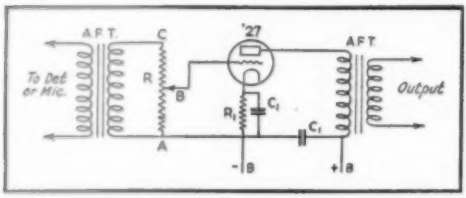


FIG. 3 — A SIMPLE TYPE OF VOLUME CONTROL WHICH CAN BE CALIBRATED TO INDICATE POWER LEVEL

R may be a 500,000-ohm potentiometer, preferably of the "tapered" type giving a logarithmic resistance vs. knob rotation curve, as explained in the text. R_1 is the usual cathode bias resistor used with heater type tubes and condensers C_1 serve as by-passes.

reproduced here are somewhat small for practical work, it is recommended that they be used as models for larger ones plotted on graph sheets of the semi-logarithmic type, such as Keuffel & Esser No. 358-72L. These sheets can be obtained in stores that handle draftsman's supplies. The preparation is quite simple, consisting only of the notation of the coördinates and the drawing of the diagonal straight lines. It would be less confusing, perhaps, if separate sheets were used for ratios below 1000 ("A" curve) and over 1000 ("B" curve) of Fig. 1, and for the "A" and "B" curves of Fig. 2. Then there would be but one curve on each sheet. The following table can be used in plotting the points for the curves:

FOR FIG. 1, "GAIN"

Power, Current, or Voltage Ratio	*Power* db	*Current or Voltage* db
1	0	0
10	10	20
100	20	40
1000 (1 M)	30	60
10,000 (10 M)	40	80
100,000 (100 M)	50	100
1,000,000 (1000 M)	60	120

FOR FIG. 2, "LOSS"

Power, Current, or Voltage Ratio	*Power* db	*Current or Voltage* db
1.0	0	0
0.1	−10	−20
0.01	−20	−40
0.001	−30	−60
0.0001	−40	−80
0.00001	−50	−100
0.000001	−60	−120

The ratios are marked on the logarithmic vertical scales and the db values are marked on the horizontal linear scales. Coördinates designated "A" are used for the "A" curves and coördinates designated "B" are used for the "B" curves. Once the curves have been plotted they can be used directly for translating power, current, and voltage ratios to db values; or they can be used for translating known db values to power, current, and voltage ratios. They work either way and completely eliminate the bother of juggling logs and antilogs. Let's try a few examples.

SOME PRACTICAL APPLICATIONS

One of the things in which every amateur is vitally interested is the probable improvement in performance accompanying a change in his transmitting equipment. Who has not made adjustments that have resulted in increased output, as measured by the antenna ammeter, and then found that there has not been a proportionate improvement in signal strength as measured in audibility by a distant observer? Suppose we take a typical example and see how it works out.

Without changing the frequency or antenna tuning adjustments, the plate voltage on the transmitting tubes is raised so that the antenna current increases from 1 ampere to 1.5 amperes (representing a power increase of 2.25 times). What should be expected in the way of improvement in signal strength, other things remaining unchanged? The current ratio is 1.5, which, from curve "A" of Fig. 1, is seen to represent a gain of 3.5 db. Remembering that the least increase in level that is detectable by the ear is 1 db and that it takes as much as 2 or 3 db increase to make a showing in the presence of QRM, etc., it is obvious that the increase of 50% in antenna current will not do much more than bring the signal up about one notch in the "R" scale of audibility. If the signal were R4 with 1 ampere antenna current, it wouldn't be much over R5 with 1.5 ampere in the same antenna at the same frequency. Of course this is neglecting the non-linear response characteristic of the receiver (regenerative detector sensitivity is much greater for weak signals), but even then the increase in signal strength is more nearly represented by the gain in db than by the showing on the antenna ammeter.

Here is a more general problem. Suppose Bill Jones is contemplating building a new transmitter to replace his present Type '10 outfit which has an output of 10 watts. What improvement in signal strength could he expect from a set using a Type '52 and putting 100 watts into the same antenna system and on the same frequency? The power ratio is 10 and the gain is 10 db, as an inspection of curve "A" of Fig. 1 will reveal. This gain will represent something like 3 or 4 steps in audibility on the R scale so that if his signals were around R4 at Washout, N. D., with the old outfit, he might expect R7 and R8 with the larger outfit under the same conditions.

Or suppose we wish to know the improvement that can be expected with an increase in the modulation capability of a phone transmitter.

The power of the modulator is increased so that the modulation capability is made 90% instead of 30%, the carrier power remaining the same. What is the gain in db? Since the antenna current amplitude is proportional to the percentage of modulation, the improvement in modulation capability will represent a current ratio of 3. From curve "A" of Fig. 1 it is seen that this is a gain of nearly 9 db — no mean improvement in the sock of that particular phone set.

Passing on from the transmitter itself to the antenna system, suppose that W2SOX decides to add a little directivity to his 28-mc. antenna and that the particular combination he decides upon gives a rated gain of 6 db in the direction towards which he wishes to push his signals. To what is this equivalent in terms of power increase in a non-directive transmitting antenna? Consulting Fig. 1, curve "A," we find that the power ratio for a 6 db gain is 4. The directive antenna, therefore, gives him the same increase in signal strength as he would obtain by increasing the power in the non-directive antenna to 4 times its normal value. Since the array necessary to give this gain might consist of nothing more elaborate than two "couplets," each consisting of a half-wave antenna backed up by a reflector spaced a quarter-wave behind it, with the two antennas excited in phase, it is obvious that directive transmission is decidedly advantageous.

THE STANDARD REFERENCE LEVEL

The decibel is primarily a unit that is used to specify gains and losses with reference to the power value at some point in a system, irrespective of what the actual value of the reference power may be. Since the unit is based on a power ratio, however, it is natural to assume a standard reference power value and use the db to express amounts of power as being so many db above or below this value. Several reference levels have been more or less generally used, but the standard in broadcast and allied fields at the present time is .006 watts or 6 milliwatts. When a broadcast engineer says that a microphone is "30 db down" or that his level is "plus 8 db," he has this reference power in mind. Practically all the broadcast and telephone equipment used in this country at the present time is rated and calibrated on the basis of this reference level. When a pick-up amplifier is rated as having a "maximum undistorted output level of 6 db," it means that the power output is 6 db (power ratio of 4) above 6 milliwatts or that it is 24 mw. A fairly accurate picture of the meaning of loudness in terms of the standard reference level of 6 mw. can be obtained from the following approximations: Good R9 signal strength on a telephone headset is about +2 db; loud, loud-speaker volume is about +20 db. A reference level of 10 mw. is sometimes used, but unless otherwise specified the reference power of 6 mw. can be assumed.

MEASURING POWER LEVEL

There are several types of audio-frequency power level measuring devices in general use. One type which is self-contained and requires no battery supply for its operation is that in which a rectifier type voltmeter is used as the indicating instrument in conjunction with a variable attenuator made up of suitable resistors and calibrated in db. This type is usually designed for operation across a 500-ohm line. A voltmeter reading of 1.73 volts corresponds to zero db level for a reference power of 6 milliwatts when the instrument is connected across a 500-ohm line. The voltmeter scale is calibrated from −10 db to +6 db and the attenuator which is calibrated from 0 to 30 db further extends the use of the instrument — something like connecting a resistance in series with a low-range voltmeter to increase its range. The attenuator for this type of indicator necessarily must be so designed as to present a constant input impedance in order to prevent its affecting the frequency characteristic of the line to which it is connected. The variable attenuator is usually of the "L" type in which a series and a shunt resistance element are varied simultaneously. The design of attenuation networks is a whole story in itself and will constitute a separate article in a future issue of *QST*.

A second type of power level indicator is that in which a vacuum tube is utilized as a v.t. voltmeter. This type is more adaptable to amateur uses and has been treated in a previous *QST* article.[3] A modification of this arrangement is generally used as the volume or "gain" control in amateur receivers and in the speech amplifiers of phone transmitters, the attenuator being connected as a voltage divider in the grid circuit of an audio amplifier as shown in Fig. 3. Such a simple attenuation arrangement can be used only where there is practically no current flowing through the resistor and where the impedance into which the attenuator system couples is much higher than the resistance of the attenuator. These conditions are satisfied in the grid circuit of an audio amplifier such as that illustrated. The position of the sliding contact or tap-switch on the resistor R determines the value of the signal voltage applied to the grid circuit of the amplifier tube, the ratio of the voltage on the grid to the total voltage across the secondary of the transformer being proportional to the ratio of resistance AB to the total resistance AC. *But the volume level will not be proportional to the ratio of the resistance values.* If the potentiometer is of the type having a straight-line resistance vs. knob-rotation curve, the volume level will not be decreased noticeably until the gain has been backed off about ⅓ of the total sweep of the knob. And there will not be a noticeably rapid

[3] "Volume Level Indicators," Omer, *QST*, November, 1930; and correction in following issue. Figs. 2 and 5 of this article should be interchanged.

decrease in volume level with decrease of the resistance *AB* until the contact has gone past the half-way mark. This is shown graphically in Fig. 4, where attenuation in db has been plotted against per cent total resistance for a voltage

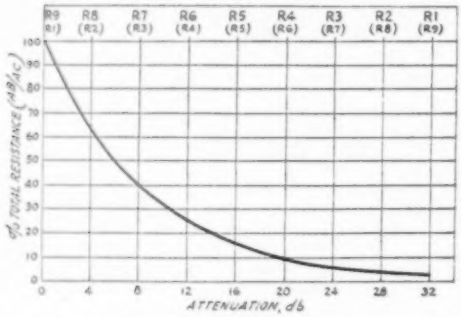


FIG. 4 — ILLUSTRATING THE RELATION BETWEEN

volume-control resistance ratio, db level, and audibility. The audibility figures in parentheses suggest a calibration for audibility measurements on received signals. Details are explained in the text.

divider such as that shown in Fig. 3. A rough comparison of the resistance ratios and signal strength in terms of the "R" system of audibility is also indicated in Fig. 4, steps of 4 db each having been allowed for each step in the "R" scale. The total attenuation between R9 and R1 is shown as 32 db, which may be taken as a practicable approximation. Since the relation between resistance ratio and volume level is a logarithmic one, it is obvious that the calibration of the potentiometer scale should be logarithmic or that a logarithmic "tapered" resistor should be used. The latter is the more practicable arrangement, since the scale calibration can then be linear with respect to rotation of the control.

A receiver volume control having a logarithmic resistance characteristic could be used to good advantage as an audibility meter by making its calibration the reverse of the "R" scale shown in the chart of Fig. 4 (as indicated by the parenthetical figures). The angular scale could have ten divisions with "10" at the zero resistance position and "1" at the maximum resistance position. A signal which was R9 would just go out of audibility at the next position above zero resistance while a signal that was R1 would be just audible with the resistor in the full "on" position. If desired, the resistor could be calibrated in db instead of in "R" units of audibility. The latter calibration would be especially applicable to the gain control of the speech amplifier of a phone transmitter.

These are but a few of the many ways in which the db can be put to work in amateur radio. Even to mention all the possible uses would run this story beyond page 98 — and it is long enough now. But we hope that the suggestions that have been made and the information that we have tried to give will serve to further the adoption of the db by amateurs. It is inevitable that we shall hear more of the thing, as future *QST* articles will show. We cannot escape it. Perhaps it even may be heard of over the air; "your sigs up 4 db now, OM — FB."

Midwest Division Convention

THE Iowa Convention of the Midwest Division, following a custom of several years' standing, was again held at Iowa State College, Ames, Iowa, in conjunction with the Radio Amateurs' Short Course of Engineering Extension Service. Ames was the Mecca for Iowa hams and for many from neighboring states on Friday and Saturday, May 8th and 9th.

The convention officially opened at 9 o'clock Friday morning with registration at the Engineering Hall of the college. The morning was spent in getting acquainted, ham-festing, and viewing the parade which was a feature of the college Veisha week. The business of the convention got under way at 1 o'clock in the afternoon when George Hansen, W9FFD, SCM for Iowa, welcomed the delegates and started things going. He was followed by A.R.R.L. Director Kerr, who, in a little talk with the descriptive title of "Pickups," told of his impressions of A.R.R.L. Headquarters accumulated during his trip to Hartford for the annual Board meeting, explained how the affairs of the League are handled, and covered the high spots of the Board meeting. The third speaker on the afternoon program was George Grammer, Assistant Technical Editor of *QST*. His talk covered the various antenna systems in common use among amateurs, and was

(Continued on page 88)

Strays

W6CKS recently put up a single-wire fed Hertz antenna following the dope in September, 1929, *QST*, and found that the resonant frequency was lower than it should have been, although re-measurement of the antenna showed the length to be right. He happened to notice that the dial light on his receiver flickered when keying the transmitter, so put an ammeter in the antenna lead to the receiver and found .3 amp. flowing! With the ground removed the current was still .2 amp. The receiving antenna was then taken down and the resonance point on the transmitting antenna shifted to the correct frequency.

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If rope halyards are soaked in boiled linseed oil before being put up there will be practically no shrinkage and the life of the rope will be lengthened. — *W6DPJ*.

Fourth International Relay Competition Results

By E. L. Battey, Assistant Communications Manager

JUST after the "smoke of battle" from the Sweepstakes Contest had cleared away, Old Man DX summoned his cohorts around him to participate in what turned out to be "the greatest and most successful International Relay Party yet held"! The period chosen for the fray was March 8, at 0000 G.C.T., to March 22, at 0000 G.C.T., and it was two weeks just crammed full of DX contacts.

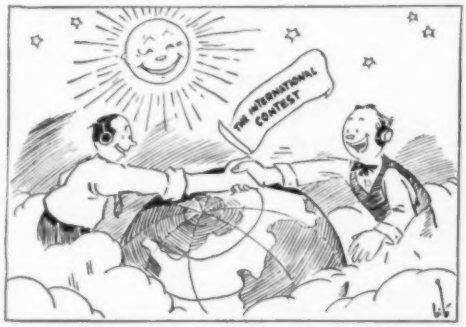
Conditions were generally exceptionally good for DX communication throughout the entire period of the tests. Old acquaintances were renewed! New friendships were made! Contacts with countries never before worked are reported by practically all contestants. Several stations are now members of the "Worked All Continents Club" as a result of their participation. Among these are W8SY, W8BNU, and W9AZZ. VS6AH made *nine* eastern states amateurs WAC members during the contest. The tests gave all entrants the usual opportunity to improve their operating technic. From every angle the "Fourth International Relay Competition" was a decided success.

The basic principal for scoring was that a message sent to a foreign station by a station in the United States or Canada count *one point*, both for the sender and receiver; and that a reply message received in the United States or Canada count *two points*, both for the receiving and sending station. Total scores in all localities were computed in accordance with the number of continents or United States and Canadian inspection districts worked. In the case of United States and Canadian contestants the special system of weighted credits was also included in the scoring. Complete information relative to scoring may be found on page 34, March *QST*.

In checking the logs submitted it was found necessary to reduce some scores because of infringement of rule No. 4, which stated that, "Reply contest messages must contain ten or more words in the texts . . ." All logs have been checked in accordance with the rules on page 38, March *QST*, and all reducing of scores has been based on infractions of those rules.

The highest scoring United States participant is W9UM, who made 4374 points by his work with *six continents!* That's enough to make any ham weep tears of envy. W8BKP is a high second, contacting stations in *six continents* for a score of 4002. A score of 3895 gives one of our best known DX stations—W8GZ—third place. Three others have totals above 3000; W1AKV, 3534; W6EW, 3390; and W1FM, 3325. These are very fascinating scores, but there are many others nearly as good. We are listing the twenty-five highest scoring United States participants.

Six United States stations succeeded in making message exchanges with all six continents. The lucky ones are as follows: W1AKV, W6EW, W8BKP, W8CCW, W8SY and W9UM. Thirty contestants contacted five continents; 72 worked



HANDS ACROSS THE SEVEN SEAS

four; 66 snagged three of them; 82 were able to QSO two; and the remaining 109 United States and Canadian participants were only able to make successful contact with one continent.

The foreign scores also run very high this year. G5BY leads the entire world with the almost unbelievable score of 11,872! CM8UF is second high with 5811 points. Incidentally, CM8UF had the highest score in the world in the 1930 competition. ZL2AC is close behind with 5668, which gives him third place. CM2SH has 4896 points, and is next in line. The twenty highest scoring stations outside of the United States and Canada are listed for the information of all, and to give them the prominence they deserve.

G5BY was the only foreign contestant who succeeded in making exchanges with all 14 United States and Canadian inspection districts. ZL2AC, VK3HL, VK7CH and CM8UF contacted 13 out of the 14. ZL3AS, CM2SH and CE7AA successfully worked 12. Eight participants worked 11, and seven worked 10 of the districts.

Certificates of Merit have been awarded to the leading station in each A.R.R.L. section throughout the United States and Canada, and to the highest scoring station in each country, countries being determined by the prefix used. But one certificate was awarded to any group of stations using the same prefix. The complete list of scores appears at the end of this article. The first-listed

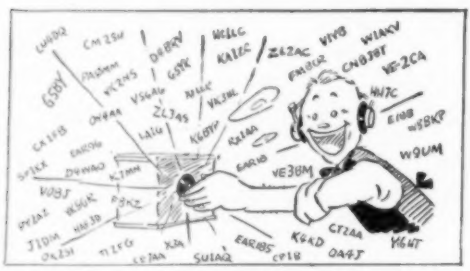
25 HIGH UNITED STATES STATIONS

W9UM	4374	W9MI	2985	W1SZ	2265	W9EF	1920
W8BKP	4002	W6AQJ	2895	W8AXA	2225	W6AHZ	1896
W8GZ	3895	W8ADG	2845	W6CUH	2136	W6CYR	1836
W1AKV	3534	W9ADN	2690	W8CCW	2052	W5JC	1740
W6EW	3390	W9DNG	2550	W8DED	2015	W6EJC	1740
W1FM	3325	W2JD	2305	W5BBQ	1992	W6CSJ	1735
						W2RD	1715

station in each Section, and in each foreign country is the certificate winner. The one exception to this is in the case of Connecticut, where W1AVV receives the award, since stations of A.R.R.L. staff members cannot receive certificates due to a Board ruling. To all winners we extend our felicitations!

POOR SPORTSMANSHIP

Probably the biggest complaint of all participants was "poor notes." United States amateurs will do well to listen to a few of the comments made by foreign contestants. It would seem that



THE WORLD AT THE HAMS' FINGER-TIPS DURING INTERNATIONAL CONTEST

a high percentage of our fellows are disregarding our regulation relative to "adequately filtered d.c. plate supplies." G6QB says, "In spite of all the admirable stuff in *QST* about high quality notes, fully 90% of the stations worked were between T1 and T4, with a lot of the former." GI5NJ: "Very few 'W' stations have anything like T9 notes — most of them are very rough." G5WQ writes, "My only kick is against the hopeless notes used by many amateurs in their efforts to get the maximum amount of juice into the antenna." These are but three of the many remarks relative to the a.c., r.a.c., i.c.w. and 500-cycle notes still in existence. There is no excuse for it, fellows, and it is anything but sporting to handicap other amateurs by the use of "illegal" plate supplies.

In contrast to the above paragraph we are pleased to record the opinion of many of the United States and Canadian contestants that the signals from foreign stations are rapidly improving in quality. W9EF says, "Ninety-two percent of the stations that I worked during the tests used crystal control." W1WV and W8CCW report "G" signals as being particularly "high quality." One of the most beautiful signals heard at A.R.R.L. HQs during the contest was that of F8EX, a splendid example of what a 1931 signal should be.

One of the requirements of A.R.R.L. contests is that all participants abide by *all regulations* of their respective countries. In all cases where infractions or violations of regulations are reported they are weighed and investigated carefully by the Irregularities Committee. In all cases where sufficient evidence of guilt is found, disqualifications are made. The following reports have been received regarding the irregular operation of station G5BY during the contest we are recording. The Council of the R.S.G.B. protested the operation of G5BY in the contest, stating its opinion that the station used more than the 50 watts permitted by the licensing authorities, also citing its belief that the following regulations of the country were violated — "Licenses are granted on condition that stations are operated for a period not exceeding 15 minutes in each hour, also periods of transmission must not exceed two hours in all during any consecutive period of 24 hours. Only one person is permitted to operate a licensed station." G5IS reporting his score individually alleged that G5BY operated outside the frequency band allotted to British

HOLDING UP THINGS

amateurs, or 20 kc. beyond their buffer-band limit of 14,340 kc. G6QB and G6NF also called attention to some of the same discrepancies held against G5BY.

The Award Committee examined the different evidence received against G5BY and endeavored to secure further information to assist in its

20 HIGH FOREIGN PARTICIPANTS

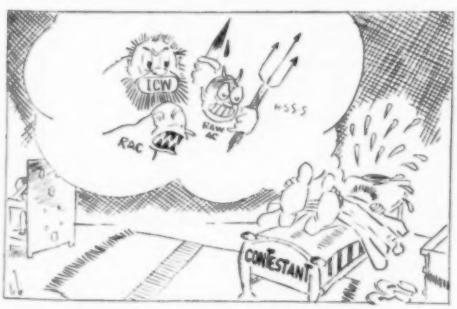
G5BY	11872	ZL3AS	3792	VK2NS	2700	VK5WR	2120
CM8UF	5811	VK7CH	3159	CM8YB	2596	F8EX	2010
ZL2AC	5668	ZL4AO	3091	VK3ZX	2585	LU3FA	1850
CM2SH	4896	G6RB	3047	ZL1AR	2519	VK7JK	1791
VK3HL	3900	K4KD	2894	VK3WL	2189	VK3RJ	1750

deliberations. Examination of the time entered in different logs from other British participants indicated that very many would be disqualified should the Committee require the absolute observance of the time limitation regulation cited. The Committee did not find the requisite amount of evidence to class this station with others disqualified for off-frequency operation. Furthermore, a statement was received showing the station had only a single operator with a special arrangement for avoiding interruptions. Therefore the Committee was forced to the conclusion that there were insufficient grounds for action, but directed publication of the circumstances.

DISQUALIFICATIONS AND IRREGULARITIES

There are four disqualifications for off-frequency operation — W2BYP, W4PJ, W6BYB and HAF8C. The first three would have been certificate winners in their respective sections had they taken a bit more care to stay within the limits of the amateur bands. Scores of stations were logged and reported off-frequency during the contest, but only approximately 35 were participants. Sufficient evidence was presented to disqualify but four of those 35. A single report was deemed "insufficient evidence."

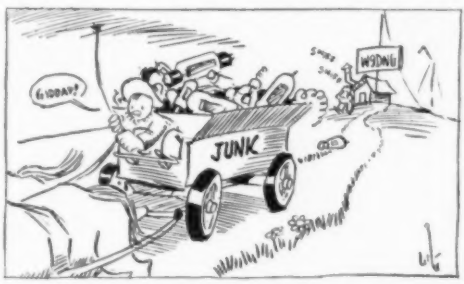
The Award Committee regrets the necessity of making any disqualifications. In view of the serious reflection on the ability of amateurs as a class to control their transmissions and limit



THE AFTER CONTEST DREAM

these to specified frequencies, the complaints of increased interference on 6905 and 14,440 kc. from off-frequency operation during the contest and the pending Madrid International Radiotelegraph Convention when such examples can be used by anti-amateur delegates to further their interests, it was felt necessary that these penalties be enforced. Had our Observers functioned more effectively the Award Committee doubtless would have been obliged to chronicle a greater number of disqualifications.

Reports were received from KN2, PXR, XNJ2PA and XK4XDB. These were sent in in almost every case in order that W and VE participants might be given full credit for the work accomplished. Since the operations of these unlicensed stations were illegal the Committee



WHEN THE BATTLE WAS OVER

has been forced with regret to order that the scores cannot be published in these individual cases.

A number of stations sent in logs and copies of messages handled simply to help other participants, and claimed no scores to their own credit. However, in cases where complete information was given these stations have been granted scores and are listed with the participants (being marked with an asterisk) in the list of scores. In a few cases stations sent in copies of messages handled for the benefit of others, but failed to give all information required in the rules. They therefore cannot be given scores, but are here listed so that they may receive the credit due them: VE1DQ, KA1HR, W1BBY, W1UV, W2CYI, W3AOO, W3GP, VE5CO, W6QP, W6EGH, W8CZP, W8DBG and W9DPB. The number of continents with which successful message exchanges were made by each W and VE participant, and the number of United States and Canadian inspection districts contacted by each foreign contestant is shown in brackets with the call in the list of scores.

NOTES OF INTEREST

New Zealand and Australian contestants state

that the most outstanding signal during the tests was that of W6EW. XI1ER also heard W6EW calling G6BY and ZL3CM, and states that he was the only W6 heard during the contest. The logs plainly show that in the majority of cases the use of "CQ DX" and "CQ Test" calls by United States and Canadian stations were unproductive. Most all contacts were established by *answering* CQs and "Test" calls from foreign stations. What is believed to be the most outstanding low-power contact of the tests was that of W1AKV and G6PM, when G6PM was using only *1½ watts input* to a 2-volt receiving tube!! W6CTP worked four continents and made a score of over 500 using a single type '71A. G2OA writes, "Even if my call may be at the bottom of the list, the chap at the top couldn't have had more fun getting his score than I did with my 6-watts input to a DE5 valve (equivalent to an '01A)." W4SR transmitted a message to ZL2BG by the medium of 14-mc. 'phone. ZL2BG reports W4SR's 'phone signals copied on loud speaker for over an hour and a half. VE1DQ, using 14-mc. 'phone, worked OH5NG and took a reply message from him. W9UM claims that 50% of the credit for his making first place in United States should go to his YF. She arranged meal hours and cat naps at any hours convenient to him during the day and night. His ears became blistered during the two weeks of night and day work, and his right arm became numb, requiring alcohol rubs! That's what these contests do to a fellow. Hi. W6DJP says signals from Europe rolled in nicely around 7:30 a.m. P.S.T. — G5BY, G2VQ and F8PZ coming through particularly well. W7AUL reports ZL2AC and K6ERH most consistent stations heard during contest. VE2CA says ZL2AC was most prominent ZL heard. W6SA reports G5BY the only European station heard. According to W6CSJ, G5BY was the most consistent European heard, LU3FA most consistent South American, VS6AH best Asian, K4BPF best North American, VK3JK best in Oceania, and ZS5U best in South Africa. The usual loss of apparatus was reported all around, and of course a contest wouldn't be complete if there were no power leaks. W9DNG burned out four 250-watters, one 50-watter, one 7½-watter, two "S" tubes, two motor generators, a mercury arc keep alive system, four filter condensers and two audio transformers. Oh! Oh! On Friday *the 13th* VK2HU's power supply went up in smoke! The 7000- and 14,000-kc. bands were used about fifty-fifty during the tests. 14,000 was found to be the most reliable band for European contacts and 7000 for Oceania. The fellows with low and medium power were able to make many more contacts on 14,000 kc. — signals on 7000 kc. needed plenty of punch to get through the QRM.

CONCLUSION

A total of 532 stations are listed in the scores; 365 are in the United States and Canada, 167 are in foreign localities. It is known that many more stations exchanged messages during the tests but failed to report, either because they thought their scores too low or because they were not actually competing. The world was literally "at the hams' finger-tips during the International Contest." It is estimated that stations in approximately sixty-five different countries were on the air. DX is not dead!! It is just as intriguing and luring as ever before. The international friendships made possible by the "4th International" cannot be overrated. . . . It's one of the biggest kicks in ham radio to be able to shake hands via the ether with fellow humans in every corner of the world. The consensus of opinion is that the contest just described was "the best yet," and in closing their reports contestants say, "We want more." You're going to get it!! So polish up the outfit and watch *QST* for the first announcement.

SCORES

THE FOURTH INTERNATIONAL RELAY COMPETITION

(Asterisks denote stations not entered in contest; reporting to assure that stations they worked get credit.) (Number continents worked shown in parentheses after call.)

E. Massachusetts

W1AKV	(6)	3534
W1FM	(5)	3325
W1WV	(3)	1143
W1VS	(4)	1048
W1AQT	(5)	995
W1RY	(5)	720
W1ME	(3)	627
W1AXA	(3)	423
W1ZM	(3)	351
W1CPB	(2)	292
W1CRW	(4)	192
W1KM	(3)	192
W1BLO	(3)	165
W1LZ	(2)	156
W1KH	(3)	153
W1ZZ	(3)	117
W1AZY	(2)	114
W1CPS	(2)	108
W1CLJ	(2)	96
W1LQ	(2)	84
W1FS	(2)	48
W1BXC*	(1)	27
W1BET	(1)	12
W1ARG*	(1)	9
W1CCR*	(1)	4
W1ZI*	(1)	4

Connecticut

W1SZ	(5)	2265
W1AVV	(4)	596
W1ZY	(4)	516
W1AFB	(3)	324
W1CEK	(2)	264
W1AYX	(2)	108
W1CLH	(1)	4

New Hampshire

W1AVL	(4)	1540
W1BFT	(4)	1268
W1CAF	(4)	812
W1AFD	(4)	628

Maine

W1EF	(3)	288
W1CFO	(1)	18
W1APU*	(1)	6

W. Massachusetts

W1AFU	(3)	252
W1BKS	(2)	120
W1CQR*	(1)	30
W1AJD	(2)	24
W1ZB	(1)	12

Rhode Island

W1AGI	(1)	9
W1MO*	(1)	6
W1DW*	(1)	6
W1BUX	(1)	3

N. Y. C. — L. I.

W2JD	(5)	2305
W2CKR	(4)	768
W2AIS	(4)	588
W2AOA	(3)	570
W2BSR	(4)	448
W2BOK	(3)	180
W2BDA	(2)	114
W2CMU	(2)	42
W2VH*	(1)	36
W2BST	(1)	24
W2BPD	(2)	22
W2AWQ*	(1)	18
W2BO	(1)	12
W2LB*	(1)	12
W2BWD	(1)	9
W2BVG*	(1)	9

E. New York

W2RD	(5)	1715
W2CKO	(3)	318
W2BTV*	(2)	36
W2BVM	(1)	9
W2CTA	(1)	9

No. New Jersey

W2BAK	(5)	1625
W2CAY	(3)	1062
W2FL	(4)	864
W2WC	(5)	795
W2ZA	(4)	564
W2QF	(3)	423
W2AGX	(3)	423
W2VD	(2)	218
W2ALK	(3)	180
W2CGV	(1)	165
W2CQX	(4)	132
W2UK*	(2)	84
W2AOG	(2)	78
W2CPA	(2)	72
W2CIM	(2)	48
W2AFB	(2)	40
W2ADP*	(1)	27

E. Pennsylvania

W3AQI	(4)	1004
W3AWB	(3)	369
W3MZ	(4)	192
W3LZ	(3)	120
W3ADZ	(2)	102
W3AIY	(1)	18
W3AHO*	(1)	18
W8BBN	(1)	12
W3AKU	(1)	9
W3BCF*	(1)	9

So. New Jersey

W3BUF	(2)	378
W3ACX	(2)	346
W3AGJ	(2)	66

W3UT	(2)	28
W3AUI	(2)	26
W3BHD	(1)	21
W3LD	(1)	18
W3AVJ*	(1)	12
W3ANP*	(1)	9
W3SJ	(1)	6
Md. — Del. — D. C.		
W3MY	(2)	216
W3ZK	(3)	201
W3AJH	(2)	148
W3DC	(2)	144
W3NR	(2)	132
W3NM	(1)	20
W3CXL*	(1)	16
W3ACW	(1)	9
W3IL*	(1)	9
Virginia		
W3FJ	(1)	8
No. Carolina		
W4OC	(4)	1236
W4RX	(4)	952
W4AKT	(4)	712
W4JR	(4)	192
W4AHH	(2)	66
W4AEL*	(1)	6
W4EC*	(1)	6
Florida		
W4FV	(3)	339
W4NN	(1)	60
W4JH*	(2)	50
W4HC	(2)	48
W4NE*	(1)	27
Ga. — So. Carolina		
W4AJH	(3)	180
W4ABH	(3)	117
W4ABS	(2)	56
Alabama		
W4AAQ	(3)	57
W4DS	(1)	12
W4VV	(1)	9
No. Texas		
W5BBQ	(4)	1992
So. Texas		
W5JC	(5)	1740
W5MS	(4)	1592
W5LB	(4)	1040
W5DE*	(1)	6
Oklahoma		
W5QL	(4)	1480
W5BEE	(2)	28
W5OJ	(1)	15
W5BMB*	(1)	3
Louisiana		
W5WF	(3)	75
W5RR	(1)	21
New Mexico		
W5BQE*	(1)	9
East Bay		
W6EW	(6)	3390
W6BI	(1)	33
W6AVU*	(1)	18
W6CTX*	(1)	9
Los Angeles		
W6AQJ	(5)	2895
W6CUH	(4)	2136
W6CYR	(4)	1836
W6CSJ	(5)	1735
W6SA	(5)	1680
W6AHP	(4)	1588
W6EAK	(4)	1496
W6AM	(4)	1112
W6DCV	(4)	796
W6ID	(3)	333
W6AX	(2)	254
W6BBO	(3)	135
W6DGV	(3)	123
W6CXW	(3)	114
W6HT	(2)	78
W6BGC	(2)	72
W6ACL	(2)	36
W6DE*	(1)	10
W6CPC*	(1)	9
W6PE*	(1)	6
W6FT*	(1)	6
Santa Clara Valley		
W6AHZ	(4)	1896
W6DJP	(4)	1176
W6YU	(5)	1015
W6AMM*	(2)	252
W6CEO	(4)	216
Sacramento Valley		
W6EJC	(5)	1740
W6DGQ	(4)	504
W6ECN	(3)	186
San Francisco		
W6DTZ	(4)	1336
W6WB	(4)	944
W6ZS	(5)	825
W6SC	(3)	486
W6DZZ	(2)	470
W6WN	(2)	138
W6DK	(1)	30
W6ERS	(2)	24
W6CW*	(1)	9
W6BVL	(1)	3
San Diego		
W6BZD	(4)	1168
W6CTP	(4)	528
San Joaquin		
W6FFP	(3)	930
W6BYH	(3)	303
W6CLP	(1)	3
Arizona		
W6BJF	(4)	600
Utah — Wyoming		
W6DPJ	(3)	531
Washington		
W7DF	(4)	1584
W7TS	(3)	1431
W7MX	(4)	924
W7DL	(3)	603
W7KK	(2)	258
W7RT*	(1)	21
W7AJY*	(1)	6
Oregon		
W7MO	(5)	1140
W7AHX	(4)	720
W7ALM	(3)	675
W7HM	(3)	369
W7AUL	(3)	198
W7IF	(1)	51
W7PL	(1)	36
W7PE	(1)	6
W7LP*	(1)	6
Idaho		
W7ABA	(1)	51
Ohio		
W8BKP	(6)	4002
W8GZ	(5)	3895
W8CFW	(5)	1570
W8KC	(5)	1425
W8SI	(4)	1124
W8BF	(4)	732
W8DHN	(5)	565
W8CSS	(4)	492
W8DGP	(4)	428
W8BOS	(3)	393
W8BSR	(3)	312
W8UC	(4)	268
W8BNY	(3)	249
W8ANT	(3)	204
W8DVI	(2)	188
W8DSN	(2)	162
W8DUD	(3)	108
W8ANO	(2)	60
W8CBI	(2)	48
W8ADJ	(2)	44
W8BCF	(2)	28
W8DFR	(2)	22
W8LI	(1)	9
W8OQ	(1)	9
W8PL*	(1)	9
W. New York		
W8ADG	(5)	2845
W8AXA	(5)	2225
W8ADM	(4)	1268
W8HX	(5)	1155
W8CPC	(2)	296
W8BAI	(2)	260
W8BAZ	(4)	216
W8AJ	(2)	186
W8CVJ	(3)	108
W8DME	(1)	45
W8BLH	(2)	30
W8ADR	(2)	26
W8RR*	(1)	12
W8RV	(1)	9
W8BIF	(1)	6
W8QB*	(1)	6
W8CYG	(1)	2
W. Pennsylvania		
W8CCW	(6)	2052
W8BNU	(4)	1068
W8CRA	(5)	940
W8BKY	(3)	273
W8ABS	(2)	118
W8DWV	(2)	36
W8BSF	(1)	18
W8BQY	(1)	8
W8AJE	(1)	5
W8VI	(1)	3
Michigan		
W8DED	(5)	2015
W8NB	(5)	1615
W8SY	(6)	882
W8JK	(3)	372
W8CU	(3)	342
W8DWM	(3)	261
W8BGY	(2)	192
W8BV	(2)	146
W8AOO	(3)	141
W8SH	(2)	98
W8DYK	(1)	15
W8BTK	(1)	2
West Virginia		
W8DPO	(3)	321
W8TI	(3)	117
Indiana		
W9UM	(6)	4374
W9ETA	(4)	900
W9AJA	(4)	544
W9EZ	(2)	288
W9DHM	(2)	54
Illinois		
W9MI	(5)	2985
W9ADN	(5)	2690
W9EF	(4)	1920
W9ECZ	(4)	1596
W9DGZ	(4)	1512
W9CES	(4)	1348
W9GV	(4)	1304
W9GFZ	(4)	620
W9ZA	(3)	483
W9ARN	(2)	444
W9ERU	(4)	400
W9FFQ	(4)	388
W9BRX	(4)	120
W9AQJ	(2)	74
W9BMD	(1)	44
W9ANQ	(2)	36
W9AFN	(2)	28
W9FQH	(1)	20
W9SI	(1)	9
W9FLH	(1)	9
W9GY	(1)	2
W9ACU	(1)	2
Kansas		
W9DNG	(5)	2550
W9DFY	(4)	1336
W9GHI	(2)	298
W9DRD*	(1)	9
Wisconsin		
W9IH	(4)	880
W9FDI	(3)	273
W9FAW	(2)	192
W9ASL	(3)	141
W9EQP	(1)	3
W9RH	(1)	3
No. Minnesota		
W9EGU	(4)	868
W9BVI	(3)	180
W9DOQ	(3)	105
W9BHH	(2)	88
W9CTW	(1)	56
W9ASW	(1)	36
W9EHI	(1)	9
Missouri		
W9CVD	(3)	573
W9GCG	(3)	324
W9AOG	(3)	177
W9DOE	(1)	12
Kentucky		
W9ELL	(4)	540
W9BWJ	(3)	297
W9BPB	(4)	212
W9AIN	(2)	116
W9AZY	(2)	68
So. Minnesota		
W9ELA	(4)	144
W9DMA	(3)	99
W9CPM	(1)	18
W9SF	(1)	8
W9BTW	(1)	6
Iowa		
W9AZZ	(3)	114
W9AHQ*	(2)	24
W9GDN	(1)	12
W9DTM	(1)	12
W9DIB	(1)	9
No. Dakota		
W9BVF	(2)	46
Nebraska		
W9DFR	(1)	9
Maritime		
VE1BV	(2)	300
VE1AN	(1)	27
Quebec		
VE2CA	(4)	1468
VE2AC	(2)	84
VE2AA	(2)	72
VE2AP	(2)	30
Ontario		
VE3BM	(4)	864
VE3BK	(5)	720
VE3BC	(4)	436
VE3DD	(4)	384
VE3XC	(2)	60
VE3BF*	(1)	9
Manitoba		
VE4BQ	(3)	879
VE4FX	(1)	121
VE4DK	(2)	96
Saskatchewan		
VE4AI	(3)	144
VE4CV	(1)	99
VE4GU	(2)	24
VE4GF	(1)	3
British Columbia		
VE5AW	(4)	1320

FOREIGN SCORES

(Number United States and Canadian districts worked shown in parentheses after call.)

EUROPE

England

G5BY	(14)	11872
G6RB	(11)	3047
G2NH	(9)	1368
G5WQ	(8)	1312
G6QB	(9)	1260
G6HP	(9)	1206
G6WY	(9)	1143
G6NF	(9)	1134
G6XN	(9)	1098
G5IS	(8)	1040
G2BY	(9)	999
G5VM	(9)	972
G2DH	(7)	630
G5BJ	(7)	588
G6WN	(7)	518
G5BZ	(9)	513
G6GS	(6)	444
G5YK	(5)	215
G6LK	(5)	190
G2UX	(6)	126
G6DH	(4)	52
G2JU	(3)	39
G2OP	(3)	36
G2OA	(4)	32
G6GX*	(2)	8
G2IO	(1)	1
G6PM	(1)	1
G6AX*	(1)	1

Scotland

G5YG	(8)	392
G2MA	(5)	280

Irish Free State

EI8B	(10)	950

No. Ireland

GI5NJ	(4)	92

France

F8EX	(10)	2010
F8KZ	(8)	856
F8RJ	(9)	513
F8TQ	(6)	198
F8PM	(6)	186
F8RQ	(6)	150
F8FG	(4)	144
F8FO	(6)	126

Netherlands

PA0QQ	(9)	1215
PA0MM	(6)	450
PA0QF	(7)	448
PA0FLX	(4)	40
PA0FB	(3)	12
PA0QL	(3)	9

Belgium

ON4AA	(8)	1200
ON4DJ	(3)	30
ON4RO*	(2)	8

Spain

EAR96	(8)	1128
EAR18	(8)	504
EAR185	(6)	180
EAR10	(3)	48

Hungary

HAF3D	(5)	410
HAF3C	(4)	140
HAF6B	(3)	51

Italy

XI1ER	(6)	360

Norway

LA1G	(6)	324
LA1W	(1)	1

(*Continued on page 44*)

Two Top-Notchers in the International Contest

W9UM, Syracuse, Indiana; W8BKP, Washingtonville, Ohio

W9UM, the high scorer in the International Contest, is located in northern Indiana near the city of Syracuse on a point of land known as the Wawasee Slip, extending about three hundred feet from the main shoreline of Lake Wawasee.

Two transmitters are used. The set in the left-hand panel in the photograph is operated on the 7-mc. band and employs a High-C Hartley circuit with a 203-A tube. The panel to the right is operated on 14-mc. and uses the same circuit with a single 852. This transmitter went on the air just four days prior to the Fourth International Contest.

The cabinet below the transmitters contains the filament transformer, primary rheostat, filament voltmeter, high-voltage d.c. meter on the generator output, and filament switch. Both transmitters are keyed in the filament center tap.

The lower part of the desk is divided and the Esco motor generator is placed on the lower shelf. This machine consists of a compound-wound, 1500-volt, 600-watt generator driven by a 1½-hp. a.c. motor. No filter is used, aside from r.f. chokes, and reports on the character of the note average pure d.c. to xtal.

The upper shelf holds the batteries for the receiver, r.f. chokes in the generator leads, a local city telephone, and switches to shift the filament and plate from one transmitter to the other. The telephone and switches are accessible through the door at the right.

The receiver is a regenerative one using a Phillips 609A detector tube and a transformer-coupled Phillips pentode in the audio stage. Plug-in coils are used and all frequencies from 16,000 down to 500 kc. are covered by the use of a left-hand dial which controls a variable lumped capacity. The middle dial works a midget condenser used for band spreading and the dial to the

W9UM, WINNER OF THE INTERNATIONAL CONTEST

The two transmitters, receiver, monitor and power control panel are visible in this photo. All batteries, power supply equipment and other accessories are concealed in the bottom of the desk. The rug on the floor, woven by natives of Ecuador, is a present from HC1FG.

THIS LOOKS LIKE ONE OF THOSE IDEAL LOCATIONS

Most of W9UM's antenna is over water. And no BCL's nearby!

left controls regeneration. The meter measures the "A" and "B" voltages. Much time has been spent on the receiver and background noises are nil, allowing weak signals to be easily copied. Western Electric watch-case receivers are used because their light weight makes for comfort when spending long watches at the key.

Several frequency-measuring devices *à la QST* are used when the station is in active operation for O.O. work. The monitor shown to the right of the receiver is used on every transmission.

The antenna runs from the shack on an angle

INTRODUCING MR. AND MRS. W9UM

Otherwise, Mr. and Mrs. M. W. Macy. Although the XYL doesn't operate, the OM says at least half the credit for W9UM's showing in the Contest is due to her co-operation in arranging for meals and cat naps at any hour of the day or night with no domestic QRM, as well as keeping vacuum cleaners, electric irons, etc., off the air while the OM was hunting DX.

out over a channel to another point of land. It is supported by a 43-foot pole at the shack end and a 70-foot pole at the far end. The antenna proper is a voltage-fed Hertz 65 feet 3 inches long, capacity coupled to the tank circuits of either transmitter by a switch. The same antenna is used on 7 and 14 mc. as well as for receiving. It works with equal efficiency any place in the bands and to QSY from QRM or to the frequency of a station CQing it is only necessary to tune the tank circuit of the transmitter being used.

All continents have been worked on both transmitters, although a WAC certificate is lacking because confirmation cards are still due from several Asiatic stations. All U. S. A. and Canadian districts, 51 foreign countries, and ships on all oceans have been worked. A weekly schedule has been maintained with HC1FG since early in 1928 and never fails. A great deal of credit for the performance of the station is due HC1FG. On some nights as many as thirteen hours have been spent in testing, and since it is an approximate jump of 4000 miles from Indiana to Ecuador a dependable check can be had on the character of the signals.

W9UM is an Official Observer and also an ORS. A considerable number of messages were handled with the Byrd Antarctic Expedition, IPH, etc., and occasionally W9UM appears in the BPL. Macy's radio experience dates back to 1911, and several calls have been held during the intervening time. The station has been at Lake Wawasee since 1927.

NO ONE who has read the story of the International Contest in this issue will need to be reminded that W8BKP won second place. We are pleased to present some views of the equipment at W8BKP and some information about the station. It is owned by George W. Morrow of Washingtonville, Ohio.

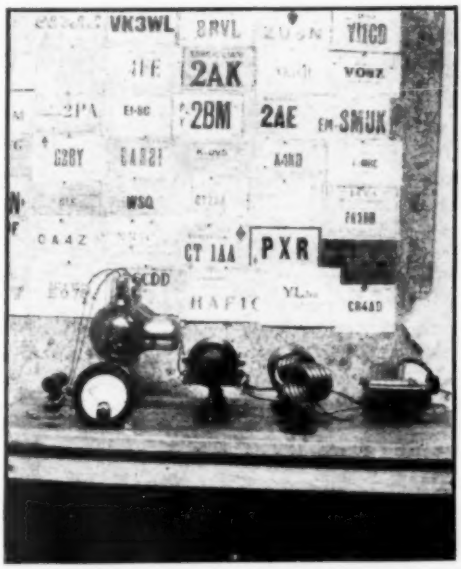
The station was first put on the air in 1920, and except for a few years when Morrow was pounding brass on shipboard, has been on consistently ever since. The original spark transmitter was replaced by a c.w. outfit when the UV–202 became popular, to be followed later by a 203–A and then a pair of 204–A's. With these sets we understand the results were only fair and the notes were even worse!

The transmitter shown in the photograph was built in 1929 and has been used with excellent results. It is a push-pull TNT outfit using a pair of 852's, and may be used on 7, 14, or 28 megacycles. Most of the work is done on the 14-mc. band. The tubes are underloaded — the input is usually between 90 and 125 watts — which may account for the fact that W8BKP gets a good note and a steady signal in spite of the fact that the filter is small. Reports on 7 and 14 mc. are always d.c.

For power supply there is a 1-kw. plate transformer giving 1500 and 2000 volts each side of the center-tap, a pair of Type '66 rectifiers, and a filter consisting of a 15-henry choke and a 1-μfd. condenser. Since the filter is small, it is possible to key in the primary of the plate transformer, and after a good deal of testing with the key in various places, this type of keying was decided upon as being the most satisfactory.

The receiver uses a screen-grid '24 detector with one resistance-coupled audio stage. Until recently a '27 was used in the amplifier, but since the Type '47 pentode was introduced one of the latter tubes has replaced the '27, with a decided improvement in signal strength. The receiving antenna is a single wire 200 feet long and six feet above ground, and is very effective in pulling in DX.

A conventional monitor is used both for check-



W8BKP'S PUSH-PULL TRANSMITTER

Simplicity itself, but then the DX record of this station proves that an elaborate transmitter is not always needed for reliable work.

ing the signal and for frequency measurement. It is calibrated from Standard Frequency Transmissions and is checked weekly to insure accuracy.

The transmitting antenna for the 14- and 28-mc. bands is a Zepp cut to resonate at 14,050 kc. The feeders are a little over 16 feet long. The antenna proper is only 6 feet high at the station

RECEIVING POSITION AT W8BKP

The receiver uses a screen-grid detector and pentode audio amplifier.

end, rising to 25 feet at the open end. A separate single-wire fed Hertz is used on 7 mc.

W8BKP gets his biggest kick from DX chasing, although traffic is handled occasionally and a good rag-chew is always welcome. With the present transmitter 91 countries have been worked in less than two years of operation, with about 1600 DX contacts. On one occasion all continents were worked every day for 17 consecutive days. Since the input rarely exceeds 100 watts, this represents some mighty consistent work for a moderate amount of power.

Fourth International Relay Competition Results

(Continued from page 41)

Azores			*Austria*		
CT2AA	(4)	112	UO3WB	(3)	15
Germany			*Poland*		
D4BRV	(3)	48	SP1KX	(2)	8
D4WAO	(4)	44	*Maderia*		
D4LLJ	(4)	40	CT3AB	(1)	1
D4ABG	(3)	33	OCEANIA		
Czeckoslovakia			*New Zealand*		
OK2SI	(2)	26	ZL2AC	(13)	5668
OK2ET	(2)	8	ZL3AS	(12)	3792
OK2OP	(1)	1			

ZL4AO	(11)	3091	*Haiti*		
ZL1AR	(11)	2519	HH7C	(6)	318
ZL2BC	(11)	1683	*Barbados*		
ZL2GQ	(6)	522	V1YB	(6)	270
ZL2GW	(7)	518	*Alaska*		
ZL2GN	(7)	364	K7MN	(3)	147
ZL3CC	(5)	170	K7ARL	(3)	93
ZL3CM	(5)	155	K7ANQ	(3)	45
ZL1AK	(3)	30	*Mexico*		
ZL3CV*	(2)	4	X1AX	(5)	130
ZL1FQ*	(1)	1	X1B	(3)	117
Australia			X3A	(4)	88
VK3HL	(13)	3900	*Canal Zone*		
VK7CH	(13)	3159	KFU2	(3)	18
VK2NS	(10)	2700	*Martintigue*		
VK3ZX	(11)	2585	F3MTA	(2)	2
VK3WL	(11)	2189	SOUTH AMERICA		
VK5WR	(10)	2120	*Argentina*		
VK3JK	(9)	1791	LU3FA	(10)	1830
VK3RJ	(10)	1750	LU2CA	(7)	287
VK5GR	(9)	1593	LU4DQ	(6)	162
VK3HK	(9)	1494	*Chile*		
VK4BH	(9)	927	CE7AA	(12)	1704
VK3ML	(9)	846	*Brazil*		
VK2LX	(7)	630	PY2AZ	(9)	855
VK3WD	(5)	250	PY7AA	(5)	180
VK6SA	(6)	198	*Uruguay*		
VK2HU	(5)	125	CX1FB	(7)	189
VK3RG	(4)	112	*Peru*		
VK3GU	(6)	84	OA4J	(4)	160
VK3LZ	(4)	76	OA4T	(2)	24
VK3BW	(3)	57	*Ecuador*		
VK3CX	(3)	48	HC1FG	(3)	36
VK5DA*	(1)	1	HC1LC	(2)	12
VK7HL*	(1)	1	*Bolivia*		
VK2JT*	(1)	1	CP1B	(1)	4
Hawaii			ASIA		
K6ERH	(10)	1060	*China*		
K6COG	(8)	680	VS6AH	(6)	1068
K6BVP	(7)	238	VS6AG	(2)	126
K6AJA*	(7)	231	VS6AE	(1)	7
K6CCS	(4)	164	*Japan*		
K6CAB	(4)	124	J1DO	(2)	68
K6CMC	(3)	48	J1DM	(2)	56
K6FCX	(3)	9	J1EE	(2)	52
Philippines			J1EI	(2)	32
KA1SL	(3)	111	J5CC	(1)	18
KA1ZC	(3)	93	J3CP*	(1)	1
KA1SP	(2)	42	*Iraq*		
KA1CO	(1)	3	YI6HT	(1)	1
NORTH AMERICA			AFRICA		
Cuba			*Algiers*		
CM8UF	(13)	5811	FM8CR	(3)	60
CM2SH	(12)	4896	*Morocco*		
CM8YB	(11)	2596	CN8JBT	(5)	50
CM2WW*	(2)	4	*Egypt*		
Porto Rico			SU1AQ	(2)	12
K4KD	(11)	2849			
K4BPF	(7)	413			
K4RJ*	(7)	77			
Newfoundland					
VO8MC	(6)	744			
VO8J	(7)	560			
VO8AW	(7)	406			
Costa Rica					
TI2FG	(8)	700			
Panama					
RX1AA	(9)	450			

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W. M. Bakewell, G6UZ, Stoke-on-Trent, England.
Carl F. Bentz, W9FUS, Platteville, Wis.
Ulric E. Duval, Worcester, Mass.
Alvin L. Haff, W9BWP, Aurora, Ill.
J. Lawrence Mott, ex-6XAD, Catalina Island, Calif.
Frank E. Warren, W5AKG, ex-W4TR, El Paso, Tex.
Everett J. Trout, W6FJ, Los Angeles, Calif.

Single-Tracking the Superheterodyne

By F. I. Anderson*

SINGLE-KNOB control of the superheterodyne can be accomplished by designing and manufacturing a condenser with freak rotor plates to be used in the oscillator circuit. But most of us aren't up to it — and don't want it anyway, because the tolerances are too rigid.

Here is a much simpler and more versatile solution of the problem. By using the proper value of series capacity with the oscillator unit of the matched gang, the effective tuning capacity of this unit can be made to track for any desired intermediate frequency. All that is required is a well-matched gang condenser and the proper *L-C* ratios in the inductances.

In the chart, Fig. 1, Curve A gives the capacity values for tuning through the broadcast band in the antennae circuit, L being taken as 220 microhenries and the gang condenser being made up of 500-$\mu\mu$fd. units. Curve B shows the corresponding capacity values of the oscillator. The intermediate frequency in this instance is that of the March, 1929, *QST* superheterodyne, 300 kilocycles. The value of L for the oscillator is 160 microhenries. The two curves are separated 3 $\mu\mu$fd. at the bottom and over 200 $\mu\mu$fd. at the top. Obviously we can't merely add a fixed sum of capacity in shunt. But the eccentricity of that equation for solving two capacities in series — the same as for two resistances in parallel — fits like the paper on the wall.

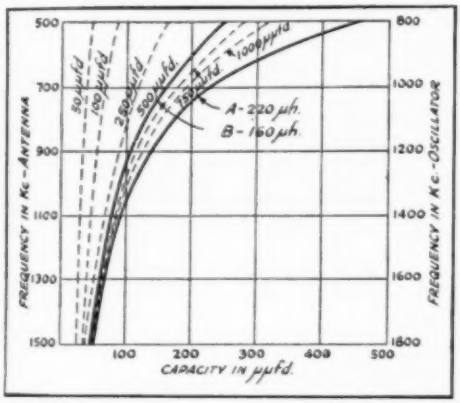


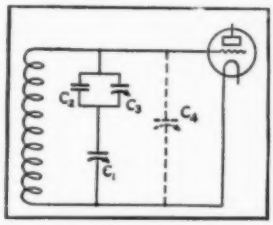
FIG. 1 — "LINING UP" WITH SERIES CAPACITY

Curve A is that of the antenna or first detector circuit, based on an inductance of 160 μh. and a condenser with a maximum capacity of 500 μμfd. Curve B shows how the oscillator tuning capacity would have to vary with a 160-μh. coil to maintain a constant frequency difference of 300 kc., the total capacity required (at 500 kc.) being 245 μμfd. The dotted curves show the effect of putting various values of capacity in series with the 500-μμfd. condenser. With a series capacity of 500 μμfd. this curve coincides almost exactly with B.

Run a few experimental curves like that at A modified by the addition of 1000, 750, 500 $\mu\mu$fd., etc., in series (such as the dotted curves in Fig. 1) and it will be found that the 500-$\mu\mu$fd. curve coincides almost exactly with Curve B.

FIG. 2 — HOW THE OSCILLATOR GRID CIRCUIT IS ARRANGED

C_1 is the regular gang condenser, C_2 the series compensator, and C_3 a small trimmer to make fine adjustments. C_4 is a trimmer employed when stray capacities are appreciable; it may not be necessary in all cases.



The equation for two capacities, C_1 and C_2, in series is as follows:

$$C = \frac{C_1 \times C_2}{C_1 + C_2}$$

The total capacity is always less than the capacity of the smaller of the two in series. Thus 5 μfd. in series with 1000 μfd. must be less than 5; and 5 μfd. in series with .001 μfd. must be less than .001 μfd. The actual values in the curves in Fig. 1 are as follows:

Frequency	*A*	*B*	*500 μμfd. in series with B*
500	460	245	240
700	235	159	160
900	142	110	110
1100	95	80.5	80
1300	68	61	60
1500	51	48	46

Fig. 2 shows the hook-up of the oscillator unit. C_1 is the 500-$\mu\mu$fd. variable unit, and C_2 and C_3 together, in parallel, form the series compensator. C_3 is a midget variable by which the hook-up is finally trimmed in actual receiving. The series capacity is on the grid side, because the filament side is common to other units in the gang. Stray capacities, if kept down, are taken care of by C_3. If they are too high it may be necessary to put C_4 across the whole.

Any intermediate frequency may be single-tracked in the same manner. First run Curve A with a suitable value of L, usually about 220 μh. for the broadcast band with a 500-$\mu\mu$fd. gang condenser. For a 300-kc. i.f., as above, start Curve B at the bottom, 3 or 4 $\mu\mu$fd. less than Curve A so as to keep the curves from crossing, which would be fatal. Curve A at 1500 kc. starts at 51. We will

* New Boston, Mass.

start Curve B at say 48, for the corresponding setting, 1800 kc. Your slide rule will tell you that 160 microhenries of inductance will be required to start this curve here. Run out the values for other settings, and you have Curve B.

The remaining step is merely to pick out the series curve that coincides. Sometimes it will be well to shift the L value slightly. Delving deep enough you can always flatten out curve A to coincide with B.

Here are some other values for different intermediate frequencies:

For 130 kc. use 200 microhenries inductance in the oscillator tuner, and 800 $\mu\mu$fd. as the series compensator. For 100 kc. use 210 μh. and 800 $\mu\mu$fd. in series. For 175 kc., the present fashionable i.f., use 225 instead of 220 μh. for the antenna tuner, and 200 μh. for the oscillator, with 600 $\mu\mu$fd. in series.

To find the number of turns for these windings use the simplified formula:

$$L=\frac{N^2a^2}{9a+10b} \text{ microhenries}$$

in which N is the number of turns; a is radius of the coil in inches, and b is the length of the coil in inches. In actual practice it is usually necessary to line up by cut-and-try, although the formula is surprisingly accurate on broadcast coils in which the ratio of diameter to length lies between 1/1, and 1/2.

I have no data on the use of this system in lining up on short waves. Theoretically it will work out, but stray capacities pile up fast and indicate the necessity for cogitation and prayer. An inspection of curves suggests an experimental layout as follows, for a tuning range of 3500–4500 kc.:

Inductances, 35 microhenries for antenna circuit, 32 μh. for oscillator; gang condensers of 75 $\mu\mu$fd., each unit, with a 700-$\mu\mu$fd. series condenser as compensator on oscillator. These are subject to trimming for stray shunt capacities.

Getting Ready for the Frequency Measurement Tests

(*Continued from page 14*)

are made by laboratories equipped with accurate frequency standards and the transmissions are also checked by the U. S. Department of Commerce monitoring stations.

TRANSMITTING PROCEDURE

The time allotted to each transmission is 8 minutes, divided as follows:

2 minutes — QST QST QST de (station call letters).

3 minutes — Characteristic letter of station frequency by call letters and statement of frequency. Characteristic letter of W1XP is "G," of W9XAN is "D," and of W6XK is "F."

1 minute — Statement of frequency in kilocycles and announcement of next frequency.

2 minutes — Time allowed to change to next frequency.

THE TRANSMITTING STATIONS

W1XP: Massachusetts Institute of Technology, Round Hill Research, South Dartmouth, Mass., Howard A. Chinn in charge.

W9XAN: Elgin Observatory, Elgin National Watch Company, Elgin, Ill., Frank D. Urie in charge.

W6XK: Don Lee Broadcasting System, Los Angeles, Calif., Harold Peery in charge.

REPORT AND TEST BLANKS

Blanks for reporting on the regular S. F. transmissions will be sent postpaid upon request. Just send a card or message to the Standard Frequency System, *QST*, West Hartford, Conn., asking for S. F. blanks. Although no formal entry in the October tests is necessary, log sheets for recording the measurements and schedules of the Official Transmitting Stations will be sent to all who ask for them. It is suggested that amateurs in foreign countries send in their requests for test material as soon as possible, particularly those who will not receive October *QST* before the tests.

WWV TRANSMISSIONS

The Bureau of Standards station WWV will transmit 5000-kc. calibration signals, accurate to within one part in a million, between 2:00 and 4:00 p.m. and between 10:00 p.m. and midnight, E.S.T., on the following Tuesdays: Aug. 11, 18 and 25; Sept. 8, 15, 22 and 29. Multi-frequency transmissions accurate to a part in a hundred thousand will be transmitted by the same station on the following schedule:

Eastern Standard Time		*Frequencies in Kc.*	
		Aug. 4	*Sept. 1*
2:00 p.m.	10:00 p.m.	3600	6400
2:18	10:18	4000	7000
2:36	10:36	4400	7600
2:54	10:54	4800	8200
3:12	11:12	5200	8800
3:30	11:30	5800	9400
3:48	11:48	6400	10,000

Reports on WWV transmissions may be forwarded via *QST*.

J. J. L.

Strays

Bureau of Standards Research Paper No. 238, "A Radiobeacon and Receiving System for Blind Landing of Aircraft," describes a 93-megacycle transmitter and receiver which will be interesting to experimenters working on the ultra-high frequencies.

The Wives and Mothers of Radio Amateurs

A New Organization of Much Interest and Many Possibilities

By Clinton B. DeSoto*

WE have YL's and XYL's — married and unmarried, active, ardent pursuers of the art of amateur radio. We have YW's and OW's, filling and rounding out the universal aspect of our hobby.

But most numerous and most important of all to the great body of amateur radio are the RM's and YF's, those possibly inactive but entirely indispensable adjuncts of the average ham station. Unheralded and unsung, despite their evident if indirect interest in all things pertaining to the station with which they are associated — intense interest indeed in all the joy brought by those foreign DX cards, all the glory of that high traffic total, all the pleasure of that workmanlike bit of station equipment — they provide a wonderful, comfortable setting for the activity of the air.

Unheralded and unsung, did we say? Too bad. Something should be done about it — by someone. And it has — by the radio mothers and station wives themselves — by a group of them down in the forward-looking Lone Star State.

Around the first of this year inspiration began stirring in that region, began surging and boiling around thoughts of just what this thing called amateur radio could mean to those whose footsteps it dogged daily without assuming the proportions of a personal interest. By February some of the Wives and Mothers of Radio Amateurs in the cities of Dallas and Oak Cliff, Texas, had determined to see that question answered, and they decided to organize a club under that name.

It wasn't to be a radio club, or even an auxiliary of a radio club. A social club, then, much the same as many another such group, but possessing the very perceptible difference of a fundamental membership requirement which provided that a prospective member, to be eligible, must be either a RM or a station YF; a club limited to, and yet outside of the amateur radio family.

Mrs. Frank M. Corlett, wife of the West Gulf Division Director, started it all — and who could do it better than the station YF of a member of the League's governing body, an old-timer among old-timers? She has been elected President, with other officers as follows: Vice-president, Mrs. Louis Peine, of W5AE; and Secretary-Treasurer, Mrs. Thomas R. Gentry, of W5RG. Mrs. Corlett, of course, lives at W5ZC.

From the Constitution of the club we learn that the name is officially decreed to be "The Wives and Mothers of Dallas Radio Amateurs," and that the objects for which it is founded are: "To bring together socially the Wives and Mothers of Dallas Radio Amateurs; to promote mutual sympathy, counsel, and interest in our husband's and our son's hobby; and with a realization that theirs is an outstanding, fascinating, far-reaching and educational hobby, it is our desire to further their interests in whatever way may present itself."

After a few semisecret gatherings in which the plan was tentatively broached and thought out, the first official meeting was held on February 19th in the form of an entertainment and buffet supper to which all the amateurs of Dallas were invited. This served the dual purpose of instituting and announcing the organization, and was celebrated with talks by Mrs. Corlett, President Richard C. Harris of the Oak Cliff-Dallas Amateur Radio Club, Assistant Radio Supervisor W. I. Abbott and Director Corlett. Readings, chalk talks, and musical selections including a vocal solo and renditions by the Oak Cliff Civic Commercial Band, entertained the party. The success of the event can be gauged by the statement that supper was served to more than 130 guests.

Meetings were thereafter held simultaneously with the monthly sessions of the Dallas Amateur Club, but recently the interval has been lessened and the wives and mothers meet twice monthly. Membership in the club is about on a parallel with the number of active amateurs in the vicinity; during the past four months it has wavered between twenty and thirty. Merely a start, of course, although a marvelous one for such a new idea.

And that last remark seems to us an adequate commentary on the whole plan. There is, indisputably, need for such organizations as this. It has been the experience of Dallas amateurs that a common bond of radio companionability sprung up in their families as quickly as the club got enthusiastically under way. It is that experience which makes logical the proposal of a national order of the Wives and Mothers of Radio Amateurs.

Fellows, there's a thought to bring into your own homes. Let's see you do some missionary work along these lines in your own family and radio circles. Affiliated clubs, and others, how

(*Continued on page 52*)

*Assistant to the Secretary, A.R.R.L.

Finding the Expeditions

AMATEURS are requested to look for expeditions in the frequency bands set aside by international agreement for assignment to the mobile service, reporting full data on call, time, frequency, and other information to the A.R.R.L. The mobile-service frequencies are:

1500–1715 kc.	175–200 meters
2250–2750	109–133
6500–6700	*44.7–44.4*
6150–6675	*45–48.8*
8200–8550	*36.1–36.6*
11,000–11,400	*26.3–27.3*
12,300–12,825	23.4–24.4
16,400–17,100	17.5–18.3
21,550–22,300	13.45–13.9

The A.R.R.L. Communications Department will issue the new expedition certificates to all reporting fully on expeditions. Also a special class of certificate will be issued to amateurs showing proof of actual service rendered expeditions in the field.

Station	*Frequency (kc.)*	*Call Signal*	*Remarks*
Schooner *Ramah*	5555, 8290, *11,110*, 16,660 (Keeps schedules with amateurs working in 7-mc. band at 8:30 p.m. E.S.T.; also works amateurs in both 7- and 14-mc. bands.)	WCEN	Forbes-Grenfell Northern Labrador Charting Expedition, E. D. Brooks, W1TL, operator. At Gready Labr. 100 miles north of Battle Harbor on July 4th. The Yacht *Strathcona* and two planes accompany the *Ramah*, to return to Boston in mid-September.
S. S. *Morrissey*	6250, *8330*, 12,300, *16,660* (Last reported using 8330 kc. or 36 m. CQ nightly for amateurs specifying the amateur band for replies, right after WHD-sked)	VOQH	Expedition to Franz Josef Land, north of U.S.S.R. reached via Iceland, Paul Oscanyon, ex-W2AZA operator. Left Newfoundland June 11th for northland.
Schooner *Bowdoin*	5555, 8290, 13,240, 16,660 (W9AHH and W9AUQ report QSO on 14 mc. 5:00 to 6:25 p.m. C.S.T. July 2nd)	WDDE	MacMillan Labrador Expedition. Ralph E. Brooks, operator (6020 kc. for rebroadcasting and 1180 kc. for relay with W9XE).
Yacht *Northern Light*	5555, *8330*, 13,240, 16,660 (W6CZO and W5BMI report XA8A and esw6 7050 kc. 5:06 a.m. P.S.T. June 15th. Amateurs are requested to try to make schedule with KGEG on 8330 kc.)	KGEG	On two-year cruise around the world, Bill Crabbe, operator. 200 miles from Sydney, Australia in mid-June. Left San Francisco April 2nd.
Submarine *Nautilus*	5555, 6620, *8290*, 8450, 11,110, 13,240, 16,660 (Will CQ for amateurs 2100 or 9 p.m. E.S.T. when under way)	WSEA	Transaretic submarine Expedition in port, Plymouth, England, for repairs. W3QV keeps schedule. W3SM QSO June 17th.
Yacht *Temptress*	5525, 8290, 11,050, 13,240, 16,580, 16,860	WIDJ	Owner, S. F. B. Morse. W8CRA kept schedule.
Portable Station in Korea	7 and 14 mc.	6ADX-6ESA	Huntington Ethnological Expedition in China, Africa, India, taking movies. Now at Keijo Chosen (Korea).
Orinoco River	8790, 11,300, 14,400 (On air returning from canoe trip in late July)	DDOE	1931 Dickey Orinoco River Expedition in Venezuela. W. J. Lanz, ex-21V-2CYT operator. Schedules W8BAD.
Oil Prospecting Houseboat	14,250–14,300 kc. (6860 kc. 11:30 p.m. E.S.T. June 4th reports W8CXC)	FX	Also on Orinoco River, Venezuela. Operators Sexton and Johnson. W1HQ and W2AGX were QSO several times in June between 4:30 and 9:30 p.m. E.S.T.
Yacht *Mizpah*	8290, 8450, 11,230, 11,050 (Reported using 5555 kc.)	KFZT	Owner, E. F. McDonald, Chicago, Ill., but station of the Radiomarine Corporation of America. Amateur contact through W9AQS.
Yacht *Mopelia*	6670	DAIV	Count von Luckner on summer cruise. J. Pascal, W2CEV, operator.
Fisherman II	8290, 11,160 (Schedules KUP on 6530 kc. at 0515 and 1115 G.C.T. for tfc)	WBEU	Bound for South Sea Islands, Australia, So. Africa, returning via Orient. Owner, Zane Grey.
Norkap II	7 mc. band	LDTE	To sail from Bergen, Norway, about July 15th, to fish salmon, take movies, etc. Traffic will be for Hartford, Conn.
Motor Car Station	8090, 8240 (FXC repeats Natgeosoc dispatch for amateurs on 8 mc. 2300 G.C.T. daily)	FPCF	Haardt Trans-Asia Expedition in Asia with personnel of 35, for 18 months. Messages for National Geographic.
'Plane NC146M	7- and 14-mc. amateur bands (May use PY call)	KHFQJ	Sikorsky Pan American Airways plane with expedition from Sao Paulo, Brazil.
Huancayo Magnetic Observatory	.....	OA4U	Carnegie Institute of Washington, Dep't of Terrestrial Magnetism station in Peru in operation this fall. S. L. Seaton, W3BWL, operator.
'Plane NR-211	333, 500, 3130, 5615, 8450, 13,240	.....	Col. Charles A. Lindbergh for proposed flight to the Orient. Amateurs are requested to watch W1MK broadcasts and newspapers and coöperate fully.
Norwegian Expedition	14 mc. band (1700 G.C.T. or around noon E.S.T.)	XLA2K	Scientific party in Greenland July 20 to September 12. Operator A. Oeverbye, LA2K.

DAILY* PRESS SCHEDULES FOR EXPEDITIONS

WGG 13,750 meters 21.8 kc. RCA-Ocean-Press 0418 G.C.T.-11:18 p.m. E.S.T. 8:18 p.m. P.S.T.
WSC 35.7 " 8400 kc. " " " 0418 G.C.T.-11:18 p.m. E.S.T. 8:18 p.m. P.S.T.
(For two hours starting . . .)

WNU 3331 meters 90.1 kc. Press 0000 G.C.T. 7 p.m. E.S.T., 6 p.m. C.S.T., 5 p.m. M.S.T.
WNU 44 meters 6810 kc. Press 4 p.m. P.S.T.

WHD 45.8 6550 Press 0600 G.C.T. 1 a.m. E.S.T.
WHD 35.9 8350 " " "

KUP* 36.5 8230 Press 1500 G.C.T. 10 a.m. E.S.T. 7 a.m. P.S.T.
KUP 28.9 11,170 " " " "

* Except KUP is daily except Sunday.

An Inexpensive Constant Temperature Crystal Oven

By Louis F. Lauman, Jr., W9GDU*

THIS crystal oven can be constructed for the same price that a good crystal can be purchased for. It represents an outlay of less than $15.00, including the thermo-regulator.

The thermo-regulator in use is a De Khotinsky type similar to that used at W1MK and a number of BC stations. The thermo-regulator is accurate to 0.25° *C*. However, this accuracy cannot be maintained without a well insulated oven. The regulator is of the bi-metallic type and has contacts that will break 350 watts, which is a decided advantage over the mercury type which requires a relay to break the current required in a crystal oven. It costs about half as much as the mercury type complete with the necessary relay, although the mercury type is, of course, more accurate. The one used here can be adjusted from the outside of the box.

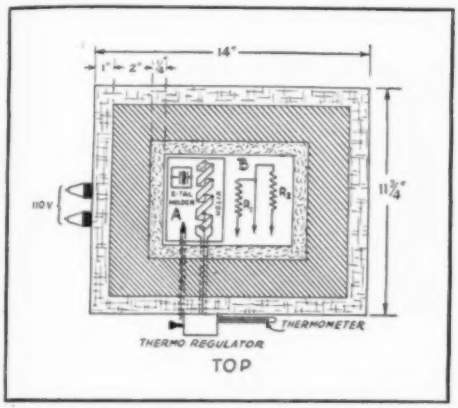
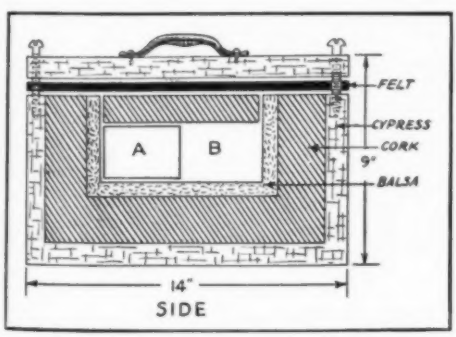


FIG. 1 — SECTIONAL VIEWS OF THE CONSTANT TEMPERATURE UNIT

The aluminum compartment "A" houses the thermostatic element, the crystal, and the bulb of the thermometer. The 110-volt supply leads pass through holes in bottle corks in the side of the compartment and terminate on stand-off insulators mounted on the outside of the box. Resistances R_1 and R_2 are the 50- and 25-watt 110-volt lamps used as heating units. The thermometer can be mounted in either horizontally or vertically.



The materials used in the construction of the oven are cypress wood, which forms the box itself (1"); Armstrong insulation cork (2" in thickness); and balsa wood (¼" in thickness). This combination forms a good heat insulator. The oven is 14" x 11¾" x 9" high, including the cypress lid which is 1" in thickness. The construction is shown in Fig. 1.

A layer of cork is mounted on all sides of the box and on the bottom. Then, a ¼" layer of balsa wood is mounted on the cork on all sides and on the bottom. All small openings where the insulating materials meet are sealed with plastic wood.

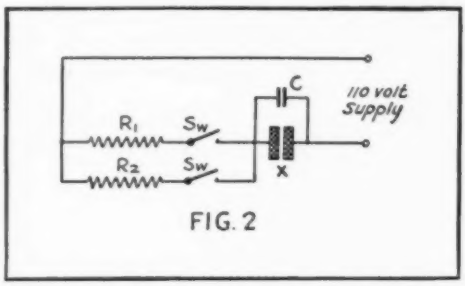


FIG. 2 — CONNECTIONS FOR THE HEATER CIRCUIT

R_1 — 50-watt 110-volt electric lamp.
R_2 — 25-watt 110-volt electric lamp.
X — Thermostat contacts.
C — 0.25-μfd. condenser.
SW — S.p.s.t. switches mounted outside box.

After the insulation materials are mounted a space 6" x 8½" results. A 1" layer of cork is placed over the opening as a sub-lid. A solid piece of ¼" felt is mounted over the entire top as a second sub-lid. Then, a 1" cypress lid is screwed into the four corners of the oven, thus putting quite a bit of pressure on the felt, sealing the oven.

The crystal is not placed in the same space as the heaters but an aluminum box, 6" x 4¼", is

(*Continued on page 90*)

*5831 DeGiverville Ave., St. Louis, Mo.

EXPERIMENTERS' SECTION

Clickless Keying

Two very similar schemes for using an auxiliary tube or set of tubes to key a transmitter have been suggested by W. H. Hannah, W2US, and C. W. Carter, W3AGT. In both cases installation of the extra keying tubes has resulted in complete elimination of clicks.

A diagram of the system in use at W2US is shown in Fig. 1. The following letter from Mr. Hannah explains how it works:

"Clicks have long been a real source of trouble and worry to a great many of the amateur fraternity, especially in the more crowded sections where broadcast listeners are numerous. Living in an apartment house as I do at present makes the problem of clicks a very real one, but a problem that has been eliminated in my case — not partially but entirely. The apparatus needed is to be found in any amateur's junk pile; in fact it is so simple and yet so very effective that the results are really surprising. All methods of keying that I had ever heard of were tried on my transmitter, which uses 852's in push-pull, and this was the only method tried that did the job.

"The circuit of the 'tube keyer' is submitted herewith and its simplicity is apparent. The tube used for the job can be any three element tube of not too high plate resistance. In my case two Type '10's in parallel proved adequate to pass the necessary plate current with a negligible drop in voltage to the transmitter. The resistor in the center tap lead can be of the variable grid leak type. The condenser capacity used was 1 μfd., but a smaller value could be used advantageously. Another resistor could be added in series across the key to reduce sparking at the contacts, but I found that this was not necessary even though the discharge from the condenser was quite heavy. The insertion of the series resistor made no difference in the final result.

"It can be seen readily that the amount of current keyed is very small with this circuit arrangement. Owing to the fact that we are not keying the load but only a very small amount of grid current in the keyer tube we are well on the road to clickless operation. The resistance of the tube and the blocking of the grid by changing value of negative bias on the keyer tubes is responsible for the absolute cut-off of plate current. The proper value of resistance can be determined by leaving the key open and varying the resistance until the current through the resistance is of such value as to block the tube, cutting off the plate current to the transmitter.

"This method will key at high speeds and has been tested to well over a hundred words a minute, making perfect tape recordings. Broadcast receivers were operated in the same room from the same supply as the transmitter, turned on full volume between broadcast frequencies, and there was not the slightest trace of a click.

"This is submitted with the hope that others of the gang will try it and find it as much of a godsend as I have. I thank the originator of this method, Mr. F. B. Kennell, R. C. A. Communications, Inc., Riverhead, N. Y."

W3AGT uses the diagram shown in Fig. 2, and has this to say about it:

"Referring to the diagram, consider that the control tube functions to open and close the center tap. When the key is depressed the 'C' bias voltage is shunted through the 100,000-ohm resistor. The control tube plate resistance is lowered giving the effect of closing the center tap.

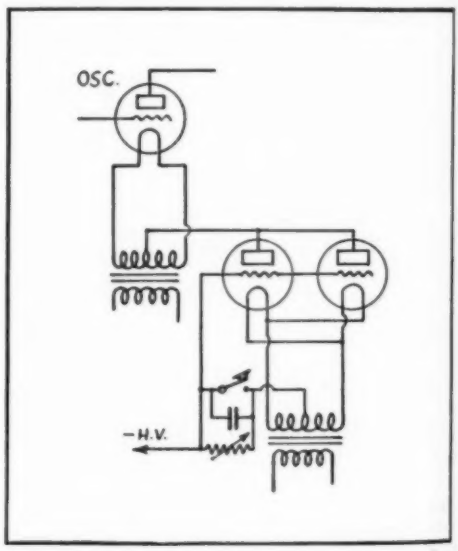


FIG. 1

When the key is up the 45 volts from the 'C' battery is sufficient to increase the plate resistance so that in effect the center tap circuit is open.

"Using a 100,000-ohm resistor the amount of current handled by the key contacts is less than one-half milliampere. The ¼-μfd. condenser connected across the key contacts effectively

prevents a slight click that might result from breaking even this small current.

"The control tube offers some resistance even with the 'C' bias removed, and the oscillator out-

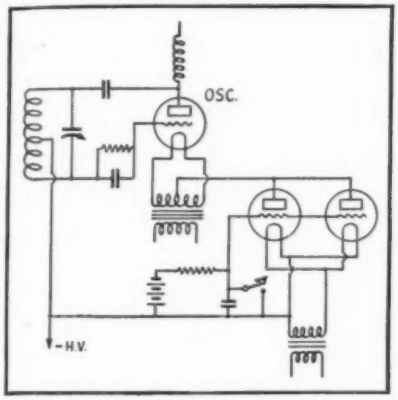


FIG. 2

put is therefore decreased slightly over straight center-tap keying. To reduce this loss several tubes may be paralleled. As many as five or more tubes could be used on higher power transmitters. In our case two tubes give very slight loss, about 8%. The tubes used are of the 25-cent variety. The type '45 tube is used because of its low plate resistance when the grid bias is removed.

"The filaments may be connected either in parallel or in series depending on the available filament voltage, which may be either a.c. or d.c.

"No trace of click is noticed on a sensitive broadcast receiver nearby."

Super-Regenerative Circuits

The circuit of Fig. 3 was sent us by Ricard P. West, 506 S. 41st St., Philadelphia, Pa., and a similar circuit was suggested almost simultaneously by M. Leubbers, 3950 Page Blvd., St. Louis, Mo. It is an adaptation of the once-popular Flewelling circuit, and both Mr. Leubbers and Mr. West have reported excellent results with it. A single tube is used to generate the "variation" frequency and simultaneously act as a detector.

The constants for the various parts are shown under the diagram. The purpose of the switch S is to allow changing from straight detection to super-regeneration for purposes of comparison. "B" voltages between 45 and 90 volts should work well.

The tuning coils, L_1 and L_2, may be any of the usual commercial short-wave plug-in coil sets, or may be made similarly. In Mr. Leubbers' outfit condenser C_2 is omitted and L_1 is a coil of 20 turns of No. 18 wire on a 3-inch form fitted up with a sliding contact to allow changing the number of turns. The tickler coil, L_2, is wound on a two-inch form, and has enough turns to allow the tube to oscillate readily.

Mr. West also has used a few other modifications of the circuit in his experimental work with it. The fundamental arrangement is the same in each case, however.

Grid Bias Without Batteries

The problem of securing grid bias for modulator and speech amplifier tubes without batteries presents a good deal of trouble to the average ham. There are several methods of obtaining bias by resistances in the plate supply leads but this has the disadvantage of lowering the effective plate voltage by the amount of the bias voltage, and also requires heavy duty resistances, which is an expensive item to say the least.

The circuit diagram of Fig. 4 has been used in the hundred watt 20-meter phone transmitter at W9BKO for several months and has performed satisfactorily without a hitch. In addition to low cost a very smooth adjustment of grid bias is secured and the plate current of the three 50-watt modulators can be set to any desired value.

Grid bias is secured by utilizing part of the IR drop across a 25,000-ohm resistor, R, used to secure gridleak bias on one of the Type '10 doubler tubes. Smooth control is obtained by a potentiometer arrangement with the variable arm of the potentiometer connected to the grid

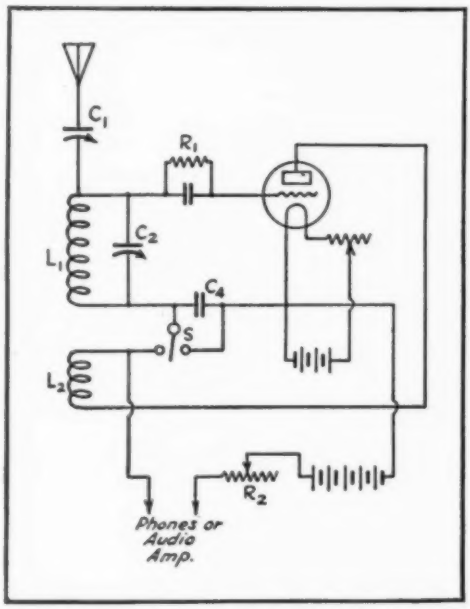


FIG. 3 — SINGLE-TUBE SUPER-REGENERATIVE CIRCUIT

L_1, L_2 — See text.
C_1 — 25–50 $\mu\mu$fd. midget.
C_2 — 150-$\mu\mu$fd. variable.
C_3 — 150–250 $\mu\mu$fd.
C_4 — .006 μfd.
R_1 — 3–10 megohms.
R_2 — 50,000-ohm variable resistor.

of the modulator tube through the input transformer. Care should be taken in the first adjustments to make sure that the r.f. stage is in resonance and really amplifying or there may be fireworks. From a study of the potentiometer arrangement it can be seen that any bias voltage up to the total bias on the r.f. stage can be placed

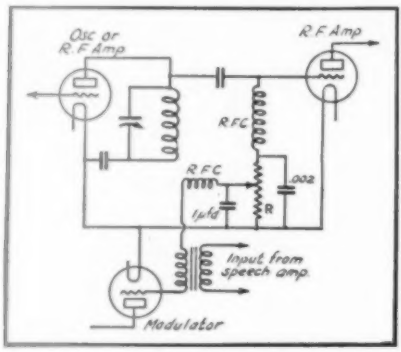


FIG. 4

on the grid of the modulator tubes. The radio frequency chokes are absolutely essential and the by-pass condensers desirable for proper operation.

The writer cannot recall of having seen this idea in use before, but can vouch for its performance and reliability.

— Everett L. Dillard, W9BKO

A similar scheme is in use at KWG, Stockton, Cal., except that glow tubes are incorporated in the biasing arrangement. Vernon L. Harvey, W6BCH, technician at KWG, writes as follows concerning it:

"For the last two years we have been using a system of obtaining 'C' bias for our buffer and modulated amplifiers as well as the modulators which I have not seen in print as yet.

"The grid return from our modulated amplifier, instead of terminating at a bias generator or batteries, terminates at a pair of '74 glow tubes, used in BCL sets as voltage regulators. The two tubes in series give 180 volts bias to these tubes (two 211's).

"The grid return from the buffer stage terminates 'one tube from ground,' giving 90 volts. Across the two tubes in series is shunted a 50,000-ohm potentiometer, the center arm going to the modulator grid return, which gives a variable 'C' voltage up to 180 volts."

Grid and Plate Condensers

The following letter from W9CGC may help some of the fellows who are having trouble in getting Western Electric tubes to work right at high frequencies. The dope is certainly worth a trial.

"I had been using a 211 as an oscillator in a Hartley circuit and had very good results, but it went west. A W. E. 211-D was obtained to replace it, but I had trouble getting it to work right. When tuning the transmitter with the key closed I could tune the antenna to a point where the radiation indicator showed about an amp and a half, but on opening the key and again closing it the tube would not break into oscillation. With the filter disconnected the transmitter worked OK.

"I finally gave up trying to guess what the trouble was and turned to my file of *QST*'s. I found an article regarding plate and grid by-pass condensers, and decided that a very small condenser in both circuits would remove my difficulties. With three .00025 μfd. condensers in series for the grid by-pass and two .0005 and a .00025 in series for plate by-pass everything worked as it should. The first QSO with these values of capacity in the two circuits was with W7KK, who was clicked at 9:15 p.m. This is rather unusual so early in the evening because of QRM on the west coast at this hour.

"Increasing or decreasing the grid leak resistance did not help in this case. A 10,000-ohm leak is being used at present.

"It appears that the value of the by-pass condensers in both plate and grid circuits is more critical than has been thought."

The Wives and Mothers of Radio Amateurs

(Continued from page 47)

about getting a wives' and mothers' club organized along with your own, not necessarily as an auxiliary, but as an independent and worthwhile entity. Initial organization and plans can be based on the Dallas club's success, with individual groups branching out into any of the fields into which women's social clubs regularly venture.

"Teacupping" has been an integral part of diplomatic amateur radio ever since the 1927 Washington conference. It seems likely that it has a place here, too, with a communion of family radio interests being reached over the afternoon teacups and evening suppers of ladies associated with amateur radio.

Strays

When using Pyrex bowls as lead-in insulators a threaded rod twelve inches or more in length is necessary to connect the two. If the threaded rod cannot be obtained a piece of copper tubing may be substituted by sinking a 5-32 brass bolt in each end of the tubing and soldering them in place. The heads of the bolts must be removed first, of course.

— W8BR–DXJ

THE COMMUNICATIONS • DEPARTMENT •

F. E. Handy, Communications Manager — E. L. Battey, Asst. Coms. Manager

More Amateur Station Licenses Revoked!

THE "borrowing" of call signals, use of false calls, and flagrant operation by unlicensed amateur stations has been called to our attention all too frequently in recent months. There is no excuse at all for any such operation in a country where operating regulations for amateurs are as liberal and licenses granted as freely as in the U. S. A. Such abuses of amateur rights reflect seriously on the character of the individuals concerned, and if we interpret correctly the indignant expressions from amateurs who have had their calls "borrowed," it is a matter of general opinion that such lawbreakers should be apprehended and punished summarily and adequately, or denied the right of operation which their action has forfeited.

The licensing authorities are out to check all such abuses of the amateur regulations. Last month we cited the revocation of W5NE's license for (1) use of an unauthorized call, (2) off-frequency operation, (3) failure to keep a log. This month further revocations by the Federal Radio Commission must be cited. On May 25, 1931, the Commission revoked the licenses of stations W2BVC and W2BSW (Jack Stewart, 158 E. 32nd St., Brooklyn, N. Y.) and W2CHM (Henry Meyers, 3082 Emmons Ave., Brooklyn, N. Y.), in accordance with Section 14 of the Radio Act of 1927, in view of the action of Mr. Stewart *in "loaning" his call letters* through Mr. Meyers to a third party. By "aiding and abetting" violations of the regulations amateurs make themselves liable to the penalties provided in the Radio Act.

The excellent and worthwhile work of amateurs in general message handling, expedition contact, experimental development of equipment, research in propagation phenomena, operator-training in the U.S.N.R. and Signal Corps Army-Amateur nets, repeated proof of general readiness for local or national emergencies of all kinds, and the like led the Commission to rule that *the public interest, convenience and necessity will be served by the operation of amateur station.** But the F.R.C. examines all the facts (or holds hearings if necessary) in any and all individual cases where information brought to the attention of the Commission indicates that the public interest may require otherwise. The action cited in the paragraphs above revoking amateur station licenses, or denying operating rights to those who have abused privileges or demonstrated their unfitness to be members of our great body of *good* amateurs, should serve as a warning to operators with careless tendencies as well as those who err with criminal intent. In the light of the radio law the *same* punishments may be meted out to *all* violators.

Regarding the suspension of the second district licenses by the Commission, Emery H. Lee, Acting U. S. Supervisor of Radio, commented as follows: "The high frequencies are used by a great number of services, and safety of life may be involved should there be undue interference with some of these services. A number of amateur stations are logged each month operating off frequency in portions of the radio-frequency spectrum where serious interference may result. Where it is shown that licensed amateur stations to some extent have difficulty in operating within their allotted bands, it becomes immediately apparent that the felonious operation of unauthorized stations by unlicensed operators constitutes a greater menace to safety of life and interstate commerce. Where it is found that licensed amateurs are *aiding and abetting the operation of an unauthorized station*, recommendations are made that the licenses of the amateurs involved be cancelled. Criminal prosecution, of course, might follow should it be warranted by the facts involved."

There is little need for us to add that the Radio Division now has in operation ten ** of its monitoring stations, regularly observing the operation of all services in whatever part of the country they may be located. Let us take care to observe the regulations in *every* respect. Let's sum up a few of the points we ought to bear in mind to avoid trouble with the alert representatives of the government now policing the radio channels.

(1) Use only authorized call signals, and only from such location or locations as indicated on the station license from the Federal Radio Commission.

(2) Observe the frequency bands closely. Work no nearer the edge of an amateur band *** than the accuracy of your frequency measuring equipment justifies. Check frequency regularly before going on the air each day. Keep your frequency meter accurately calibrated using the Friday-night calibration service from W1XP, W9XAN and W6XK (schedules in full in *each* issue *QST*). Build a good frequency meter † if you haven't one. Post such reminders as necessary in the station so you will check frequency often.

(3) Keep a log in accordance with the regulations.

(4) Don't loan your call signal for any use whatsoever. It is non-transferable. Avoid *any* act that might directly or indirectly be construed as "aiding and abetting" or encouraging any violation of the radio laws or regulations. Help other amateurs you contact. Notify them promptly (and in a kindly way) if you observe their signals off-frequency, broad or wabbulating, or the operation in any respect not all it should be.

F. E. H.

* Section II, F.R.C. Amateur Regulations.

** There are at the present time ten monitoring stations now being operated by the Radio Division of the Department of Commerce in regular operation, all of which are equipped with secondary standards. One of these located at Grand Island, Neb., is equipped as well, with primary standards. In addition to these ten monitoring stations in regular operation, there are also ten other points in the United States where receiving observations are made and in a few of these locations, frequency measurements are made by means of composite crystal standard measuring apparatus.

Individual Radio Division offices receive regularly measurements made on off-frequency operation of amateur stations in their particular inspection district by all the different monitoring stations. Each monitoring station measures, in so far as possible, everything within its range and, because of this, off-frequency observations of the same station may be made by two or more monitoring stations in widely separated parts of the country at, on or about the same time. Another result of this method of operation is that due to the difference in time between the Atlantic and Pacific Coast, a monitoring station on the West Coast in operation at about midnight can, circumstances permitting, make measurements of stations on the East Coast operating in the early morning hours eastern time.

*** Pp. 21 and 22, Sept. 1930 *QST*, "Bringing Frequency Measurement Up to Date." P. 49, April 1930 *QST*, Experimenters' Section.

† P. 9, Oct. 1930 *QST*, The Dynatron Frequency Meter. P. 35, Feb. 1931 *QST*, W1MK's Dynatron Frequency Meter.

Traffic Briefs

W1BKS heard a ham ask the Radio Inspector for a pink ticket because his folks had the boudoir done over in pink! Whoops, my deah!

CQ "28MC"—A True Story of To-day

By Jack E. de Cure*

In January *QST* (page IV) we invited contributions on every phase of amateur *communication* activity. New ideas and viewpoints, criticisms of and remedies for conditions, hints on DX, suggestions concerning radio club organization, information on interference elimination, exceptional two-way communication work covering emergencies, athletic games and trips, timely attention to operating practise, commentary on the place of radiotelephony, experimenting or development work in present-day amateur radio, data on low-power possibilities, 1750-kc. operation, etc., *all* are needed. There is plenty of romance and real accomplishment in amateur work. Read this contribution and the one presented last month. Then give us some real operating stories or the benefit of your views on different subjects.

In addition to publication of the best articles in *QST*, the author whose article appears to have greatest value of those received for consideration, has his choice of (1) a copy of *The Radio Amateur's Handbook* bound in leather cloth, (2) six pads of message blanks, or (3) six of the new type A.R.R.L. log books. Our offer is good throughout 1931. The article presented herewith is the prize-winning article for this month.

— *Communications Manager.*

"CQ CQ CQ ten de VK3WL. CQ CQ CQ ten de VK3WL." Then a few switches go snap. Slowly we cover the band for the 1000th time. ND again. Not even a burst of QRN. "It's lonely down here. Guess if old VK3BQ wasn't down here I would have quit long ago. — Well, we will try 14 mc. for a change. Guess that 28-mc. energy just tears straight through the heavyside and never gets anywhere. There were plenty of ZLs and W6s looking for us this morning, yet no contacts."

So coils are changed and the transmitter adjusted for 14 mc. Again "CQ de VK3WL" and repeat. Switches snap again. This is better. An R6 sig calling VK3WL. FB. Guess this is a "W." Finally he signs "VK3WL de W6BAX." Gee, that sounds like old times on 28 mc. Over we go and swap reports. "FB. CUAGN BAX, how's ten with you these days?" BAX says "Guess ten does not go good. I've not been down as QRL college. Guess I shall have to start working DX on 28 mc. to get the rest of W6 gang interested." — Number one illusion gone west. — We tell BAX how lonely we are down on 28 mc., and he agrees to get down and keep us company as often as he possibly can — FB —. Now we have something to fire at. "BAX" knows at least a few good ears are on Qui Vive and that makes it worth while. We yarn about this and that concluding with 73 and CUL.

Next day the postman brings a letter bearing a ZL postmark with a neat 28 mc. inscribed in the bottom corner. Hullo, what's this. A listener. He says "Dr OB I logged your 28 mc. sigs a few Sundays ago about 0100 GMT T6 QSA5 R5. I have been searching for the 28-mc. band for months, and the first thing I hear is CQ CQ CQ ten de VK3WL. Gee, Boy, I was thrilled to the back teeth. Five minutes later I logged VK3BQ. She's only a haywire receiver, but how she perks." Huh! again and Number 2 illusion gone west. Here's a raw recruit logging VK3BQ and VK3WL several times on 28 mc. and not a single ZL-VK QSO. Guess those ZL guys have been reading that 11-year cycle stuff and have gone up on to 3.5 mc. to work Iceland on fone. Hi. We feel a bit disappointed at all the 28 mc. energy wasted on barren shores. Down to the shack a CQ will drown our sorrows. Hi. We tune slowly over band AH-VK3WL — Good ZL2DN FB — Swap reports then. "Say, OM, do you chaps over in ZL ever worry about 28 mc. these days?" He comes back, "Hi, sure I heard you and 3BQ and VK3GC a few times lately, but the tmr here is not quite ready yet." (FB ZL2DN is getting a tmr ready.) Later we pick up *QST* and, glancing through the divisional reports, find that W —— has logged G5BY on 28 mc. *He reported it*, that's why it got in *QST*. A half a dosen more in a half dozen different localities probably heard the same transmission and said nothing about it.

Says Mr. Ham, "28 mc. is a waste of time, it's too erratic." We have 28-mc. tests in February or March. Maybe April or May would be the correct months. We think that 28 mc. requires a wholly daylight path. Maybe it does, or perhaps not. If we ran a 14-mc. test between W and VK during July–August it is fairly certain that not a point would be scored perhaps an odd station would be logged. Sounds very much like a 28-mc. test in January Eh — (But 14 mc. is very useful and perhaps our best DX band for all that) but if as soon as the July–August test was over we all abandoned the band, its usefulness would never be discovered. Why not continue to examine 28 mc. in the light of whatever the 11-year cycle will bring?

But we must have organized scouring of the band. The present picking at it is ineffective and only by a fluke will anything worth while be found out. There are a host of 28-mc. enthusiasts in various countries, but too little cohesion between them. FM8BG, D4UAH, SU8RS, G5BY, W6BAX, W2JN, VE2CA are a few calls that come readily to mind, but out here we know nothing of what these men are doing. Do they work on 28 mc. with any regularity? Do they work to a set sked? Maybe they are wondering if we in VK have forgotten that 28 mc. is on the amateur spectrum. What is wanted is *definite* information that this station or that will be on 28 mc. at a certain time (preferably Sundays). If that station is always there at that time then we will have something to shoot at.

Here is our sked for a period from July 1, 1931, to January 31, 1932. 1st sked from 2200 GMT Saturday until 0300 GMT Sunday. (This appears best time for QSO with ZL W6 China Japan etc.) and it is at this time that VK stations are mostly on 28 mc. at the present time. There are *always* a few VK stns on the air between these hours pretty well right through the year — but *now we guarantee to be there* every week-end. 2nd sked 0700 GMT to 0800 GMT this is our sunset period and also coincides with sunrise or thereabouts in Europe. VK5HG has been heard in India. VK5CM was QSO South Africa, and VU has been heard in VK3 at this time. We expect at least about 20 VK stns in the various states will be on 28 mc. for each of these skeds. The 3rd sked is from 1700 GMT to 1800 GMT each Sunday. This is about the sunset period in Europe and means about 3–30AM/4–30AM East Australian time. On this Number 3 sked G6VP and the RSGB 28-mc. group have promised to coöperate. Who's going to join us? If any VK sigs are heard on 28 mc. in any part of the globe, let us have a report and I guarantee an acknowledgment by QSL card. To the hams interested in other countries let us have something definite regarding your skeds. Send them to *QST*.

To new brasspounders be it known that the same old TPTG or Hartley used on 3.5, 7 and 14 mc. will work on 28 mc.** There is nothing tricky about a 28-mc. receiver, either. A few difficulties may be encountered at the start in getting smooth oscillation. The most common mistake made by new men on 28 mc. is to add turns to the "tickler" when it fails to oscillate, when the remedy is a few less turns. Anyway, anything that is not worth a little effort is not worth while at all. Don't let the old-timer brag about pioneering. Get down on 28 mc. regularly. Do a little pioneering yourself. Who knows you may be the first to work someplace from somewhere else. Hi. Then you may take your seat amongst the radio giants of the past. Perhaps you, Mr. Ham, in Podunk or Greenland or Patagonia, have some pet theory with regard to best time to QSO with VK. FB. Well, don't sleep on it. Let us have it and we can promise you

* VK3WL, 35 Higginbotham St., Nth Coburg N. 13, Melbourne, Australia.

** Push-pull transmitting circuits such as the ones described in *QST*.

plenty EARS. I feel quite sure that if we get a little sustained coöperation on this idea we will get somewhere on 28 mc. after all. Give it a try!!

Traffic Briefs

The U. S. S. *Discoverer*, NIJT, on its annual trip to Alaska, has just equipped one of its transmitters with new coils to cover the 7-mc. and 14-mc. bands and make possible communication with the *Nautilus*, W8EA, if and when the sub-Arctic North Pole expedition shall require such coöperation. On the first tests of the 7-mc. equipment W6DZZ (San Francisco), KT5DQF (Honolulu) and W7QI (Seattle) were worked, and test schedules were arranged with W7QI and W7TX. W6OI was contacted when testing the 14-mc. set. 100% communication schedules are maintained with Seward and the *Westdahl* on commercial frequencies.

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William B. Moore, W7WI of Spokane, is operator on the *Westdahl* this summer. L. R. Huber of W9DOA-W9AEJ operates on the *Discoverer*.

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In the last five months W2CDQ-W2ZZA has been QSO with three Asians on 14 and 7 mc.; J1DV of 7 mc. and VS7GJ and J5CC on 14 mc. Also on 3.5 mc. G6FO, G2YD and G5BY have been worked. This station, a WAC on 7 and 14 mc., has never used a larger tube than a type '10 in the final stage.

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The First Balloon Company station at Ft. Sill, Okla., W5VQ, is back on the air with crystal on 7012 kc. Schedules are desired with any one wishing a reliable outlet for traffic. This is Oklahoma's star traffic station and is manned by two operators through the courtesy of the Captain of the First Balloon Company.

— - - -

W1BHM and W8CXC report contacts with FX, an oil expedition on the Orinoco River, South America. W1BHM worked them on June 13th while FX was using a frequency of approximately 14,460 kc. W8CXC raised FX on June 4th. At that time they were on about 6860 kc. with a p.d.c. note. Additional reports on contacts with this and all other expeditions will be appreciated.

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On June 1st W1WV worked NAMS, the U. S. Naval Training Ship *Nantucket*. Several messages were received and delivered to relatives of the ship's personnel. At the time of W1WV's contact NAMS was on approximately 14,350 kc. with a 500-cycles note, and reported her position as 1500 miles east of Boston bound for Constantinople. According to Perry Johnson, ex-W1BAY, operator on the *Nantucket*, they will return to Boston in September.

Traffic Summaries

(MAY-JUNE)

Pacific led by Los Angeles (3256)	12491
Central led by Ohio (5147)	11622
Atlantic led by Western New York (4512)	10509
New England led by Connecticut (1117)	3448
West Gulf led by Oklahoma (1959)	3427
Delta led by Arkansas (1057)	1505
Northwestern led by Oregon (874)	1480
Southeastern led by Eastern Florida (572)	1407
Midwest led by Nebraska (563)	1298
Hudson led by New York City and Long Island (668)	1161
Roanoke led by Virginia (883)	1159
Ontario	632
Dakota led by Southern Minnesota (440)	613
Rocky Mountain led by Utah-Wyoming (275)	378
Quebec	221
Prairie led by Manitoba (52)	80
Vanalta led by British Columbia (71)	79
Maritime	27

834 stations originated 11,965; delivered 10,468; relayed 29,104; total 51,537 (87.5% del.)

Once again OHIO "shows her teeth" and comes to the top with 5147. Western New York also had good intentions for she comes through with a total of 4512. Los Angeles with 3256 is still plugging hard to again claim the Banner. The above summary shows the standing of all Divisions and the leading Section in each Division for the May-June reporting month. The totals of leading Sections are shown in brackets. Are you satisfied with the place *your Division* takes? Is *your Section* a leader?

BRASS POUNDERS' LEAGUE

Call	*Orig.*	*Del.*	*Rel.*	*Total*
W5VQ	71	66	1310	1447
W8DDS	517	287	622	1426
W3CXL	69	352	958	1379
W6AXM	300	605	461	1366
W8BAH	444	267	438	1149
W8CKI	165	152	830	1147
W8BJO	360	168	514	1042
W6ASH	18	37	749	804
W3SM	266	81	446	793
W1MK	117	193	397	707
W6YG	117	32	516	665
W6BPO	21	62	562	645
W6AVH	31	61	474	566
W8BSE	42	97	420	559
KA1HR	149	102	302	553
W9BWJ	160	101	282	543
W8PP	95	43	405	543
W5AUC	388	103	39	530
W5BMI	126	124	276	526
W8DES	83	27	336	446
W6AOA	47	8	385	440
W8CGS	81	92	252	425
W5AHI	3	17	394	414
W3CXM	8	55	348	411
W9OX	94	94	216	404
W6SN	32	78	261	371
W8BYD	168	109	93	370
K6FCX	165	21	174	360
W8DS8	29	14	308	351
W3BWT	72	105	155	332
W8BMG	7	53	268	328
W5ABI	110	83	132	325
W6CPF	20	6	290	325
W6HM	59	240	7	306
K6DV	214	52	39	305
W8DYH	88	48	157	293
W8DLG	8	20	254	282
K6COG	74	108	94	276
W8BPL	15	24	222	261
W9BEX	33	47	174	254
W7AWH	22	27	204	253
W9GFL	18	34	189	241
W9AET	48	28	154	230
W9FFY	103	24	103	230
W8CZP	23	37	168	228
W3MG	23	17	186	226
W6QP	53	34	133	220
W6YAU	68	139	10	217
W2SC	44	62	111	217
K6BOE	90	100	25	215
W6EKC	28	63	124	215
W6CTX	14	80	120	214
W5OJ	168	4	40	212
W5WF	16	35	160	211
W8EBT	44	23	144	211
W1ASF	86	112	12	210
W6DPJ	17	16	176	209
W5IQ	83	101	22	206
W9EDQ	43	57	105	205
W8BKM	27	23	153	203
W3AWV	81	16	104	201
W6DFR	39	95	60	194
W8BHK	50	50	90	190
VE2AC	37	63	72	172
W1BWY	80	51	32	163
W9CYT	32	58	68	158
W6AJP	20	51	78	149
W8DHQ	45	57	34	136
W6AMM	66	51	8	125
W7ALM	7	74	42	123
W6ZS	47	66	4	117
W7ZD	16	90	8	114
W2CDQ	10	72	32	114
W6EGH	1	92	16	109
W7QI	29	58	10	97
W8DU	11	52	34	97
W5CT	28	53	14	95
W3BAT	12	64	17	93
W6DMJ	22	66	3	91
W6CGM	16	61	12	89
W1DR	2	50	5	57

Special credit should be given to the following stations in the order listed responsible for *over one hundred deliveries* in the message month: W6AXM, W3CXL, W8DDS, W8BAH, W6HM, W1MK, W8BJO, W8CKI, W6YAU, W5BMI, W1ASF, W8BYD, K6COG, W3BWT, W5AUC, KA1HR, W9BWJ, W5IQ, K6BOE.

Deliveries count! A total of 200 or more bona fide messages handled and counted in accordance with A.R.R.L. practice, or just 50 or more *deliveries* will put you in line for a place in the B.P.L. Why not make more schedules with the reliable stations you hear and take steps to handle the traffic that will qualify *you* for B.P.L. membership also?

W1MK Operation

A.R.R.L. Headquarters Station W1MK now operates on frequencies of 14,008 kc., 7004 kc., and 3960 kc. in addition to the well-known 3575 and 7150 kc. channels.

Attention is called to the use of the various frequencies for Broadcasts and General Operating Periods outlined in the table shown below. A frequency of 14,300 kc. is also available for use.

It will also be noticed that in order that the time of the Official Broadcasts will not conflict with the Standard Frequency transmissions from W1XP, W9XAN and W6XK, the hour of the early evening broadcasts on Fridays has been changed to 7:30 instead of 8:00 as on other evenings.

The schedule for Official and Special Broadcasts, and General Operating Periods is printed below. *General Operation* periods have been arranged to allow every one a chance to communicate with A.R.R.L. Headquarters. These general periods have been arranged so that they usually follow an *official* broadcast. In all cases the time shown is Eastern Standard.

SCHEDULES are kept with the following stations through any of which traffic will travel expediently to A.R.R.L. Headquarters, on 3500 kc.: W2JF, W2PF, W3BWT, W3CXM, W8CKI, W8DLG, W9OX; on 7000 kc.: W4AGR, W5EB, W9BCA, W9ERU, WCEN and NY1AA.

QSL CARDS for W1MK should be addressed in care of A.R.R.L., 38 La Salle Road, West Hartford, Conn. A complete log of every transmission is made and W1MK is always glad to send any station worked a card, but frequently cards are lost when sent direct to the station at Brainerd Field. W1MK QSLs after receipt of card.

W1MK OPERATING SCHEDULE

OFFICIAL AND SPECIAL BROADCASTS

	Time (E.S.T.)	*Frequencies (kc.)*
Sunday	8:00 p.m.	3960– 7150
	Midnight	3575– 7004
Monday	8:00 p.m.	3575–14008
	10:00 p.m.	3575– 7004
Tuesday	8:00 p.m.	3960– 7150
	Midnight	3960– 7150
Thursday	8:00 p.m.	3960– 7150
	Midnight	3960– 7150
Friday	7:30 p.m.	3575–14008
	10:00 p.m.	3575– 7004

GENERAL OPERATING PERIODS

Sunday	8:15– 9:00 p.m.	3960
	10:00–11:00 p.m.	7150
	12:15– 1:00 a.m. (Mon.)	3575
Monday	7:30– 8:00 p.m.	14008
	8:15– 9:00 p.m.	14008
	10:15–11:00 p.m.	7004
	Midnight–1:00 a.m. (Tues.)	7004
Tuesday	8:15– 9:00 p.m.	3960
	10:00–11:00 p.m.	3960
	12:15– 1:00 a.m. (Wed.)	7150
Thursday	8:15– 9:00 p.m.	3960
	10:00–11:00 p.m.	3960
	12:15– 1:00 a.m. (Fri.)	7150
Friday	7:30– 8:00 p.m.	14008
	8:15– 9:00 p.m.	14008
	10:15–11:00 p.m.	7004
	Midnight–1:00 a.m. (Sat.)	7004

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W9AQS worked KFZT, the yacht *Mizpah*, on June 15th. The *Mizpah* has a calling frequency of 11,050 kc. and working frequencies of 8290, 8450 and 11,230 kc. Kindly report all work with KFZT to A.R.R.L. Hqs for *QST* mention.

ELECTION NOTICES

To all A.R.R.L. Members residing in the Sections listed below:

(The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office.) This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from A.R.R.L. members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from Members of a Section, the present incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the filing of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in Hartford on or before noon of the dates specified.

Due to a resignation in the Ontario Section of the Ontario Division, nominating petitions are hereby solicited for the office of Section Communications Manager in this Section and the closing date for receipt of nominations at A.R.R.L. Headquarters is herewith specified as noon, August 20, 1931.

Section	*Closing Date*	*Present SCM*	*Present Term of Office Ends*
Alaska	August 20, 1931	W. B. Wilson	Mar. 28, 1931
Oregon	August 20, 1931	Wilbur S. Claypool	June 2, 1931
San Diego	August 20, 1931	Harry A. Ambler	Sept. 16, 1931
Eastern New York	August 20, 1931	Herbert J. Rosenthal	Sept. 16, 1931
British Columbia *	August 20, 1931	J. K. Cavalsky	Sept. 16, 1931
Ontario *	August 20, 1931	C. D. Lloyd (resigned)	.....
Philippines	Sept. 15, 1931	S. M. Mathes	Sept. 28, 1931
New Mexico	Oct. 20, 1931	Leavenworth Wheeler, Jr.	Nov. 15, 1931
Connecticut	Nov. 20, 1931	Frederick Ells, Jr.	Nov. 30, 1931
Washington	Nov. 20, 1931	Eugene A. Piety	Dec. 6, 1931

To all A.R.R.L. Members residing in the Sections listed:

1. You are hereby notified that an election for an A.R.R.L. Section Communications Manager, for the next two-year term of office is about to be held in each of these Sections in accordance with the provisions of By-laws, 5, 6, 7, and 8.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The Ballots mailed from Headquarters will list the names of all eligible candidates nominated for the position by A.R.R.L. members residing in the Sections concerned.

3. Nominating petitions from the Sections named are hereby solicited. Five or more A.R.R.L. members residing in any Section have the privilege of nominating any member of the League as candidate for Section Manager. The following form for nomination is suggested:

(Place and date)

Communications Manager, A.R.R.L.
38 La Salle Road, West Hartford, Conn.

We, the undersigned members of the A.R.R.L. residing in the.....Section of the .....Division hereby nominate ..... as candidate for Section Communications Manager for this Section for the next two-year term of office.

(Five or more signatures of A.R.R.L. members are required.)

The candidates and five or more signers *must* be League members in good standing or the petition will be thrown out as invalid. The complete name, address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit of the number of petitions that may be filed, but no member shall sign more than one such petition.

4. Members are urged to take initiative immediately, filing petitions for the officials for each Section listed above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

— *F. E. Handy, Communications Manager*

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections on or before the closing dates that had been announced for receipt of such petitions. As provided by our Constitution and By-Laws, when but one candidate is named in one or more valid nominating petitions this candidate shall be declared elected. Accordingly, election certificates have been mailed to the following officials, the term of office starting on the date given.

West Virginia	C. S. Hoffman, Jr., W8HD	June 20, 1931
Manitoba	John L. Green, VE4BQ	July 15, 1931
Arizona	Ernest Mendoza, W6BJF	July 15, 1931
Maryland-Delaware-District of Columbia	Harry Ginsberg, W3NY	July 15, 1931

In the Maine Section of the New England Division, John W. Singleton, W1CDX and Grover C. Brown, W1AQL were nominated. Mr. Singleton received 40 votes and Mr. Brown 37 votes. Mr. Singleton's term of office began May 25.

* In Canadian Sections nominating petitions for Section Manager must be addressed to Canadian General Manager, Alex Reid, 169 Logan Ave., St. Lambert, Quebec. To be valid such petitions must be filed with him on or before the closing dates named.

Official Broadcasting Stations

(CHANGES AND ADDITIONS)
(Local Standard Time)

W2MQ (3898 kc.) 6:30 p.m., 9:30 p.m.
W3OP (7250 kc.) Mon., Thurs., Sat., 9:30 p.m.
W4AAD (3540 kc.) ('phone) Mon., Wed., Fri., 8:00 p.m.
W4ABL (3533 kc.) Sun., 6:30 a.m. Any other convenient times.
W4KX (3510 kc.) Tues., Thurs., Sun., 6:00 a.m.
W4NN (7250 kc.) Daily except Sunday, 5:00 p.m., 8:00 p.m.
W5BHV (3650 kc.) Mon., 10:30 p.m.; Wed., 7:00, 9:00, 11:00 p.m.; Fri., 7:00, 9:00, 11:00 p.m.
(7060 kc.) Daily, 11:30 a.m., 4:30 p.m.; Wed., 8:00 p.m., 12:00 midnight; Sat., 12:00 midnight.
W6AEO (7189 kc.) Tues., Thurs., 6:30 p.m.
W6CFN (3990 kc.) Wed., Fri., 6:45 p.m.; Sat., Sun., 9:30 p.m.
W6CRF (3507 kc.) ('phone) (cc.) Mon., Thurs., 8:00 p.m., 12:00 midnight.
W6CVV (7100 kc.) Mon., Wed., Fri., 6:00 p.m.
W6EGH (7115 kc.) Daily except Sunday, 5:00 p.m.
W7AYH (3625 kc.) Sun., 3:00 p.m.; Mon., 7:00 p.m.; Thurs., 8:00 p.m.
(7250 kc.) Sun., 2:30 p.m.; Mon., 6:30 p.m.; Thurs., 7:30 p.m.
W8BWP (7160 kc.) Mon., Thurs., Fri., 8:30 p.m.
W9ETD (3532 kc.) (cc.) ('phone) Mon., Thurs., Sat., 11:30 p.m.
W9FAD (1856 kc.) ('phone) Thurs., 9:30 p.m.
W9GY (7002 kc.) Daily except Sun., 9:00 a.m., 12:00 midnight.

Traffic Briefs

During the International Contest held in March, VS6AH was called simultaneously by a W7, W8 and W9. All of these when looked up in the call book turned out to be doctors. VS6AH looked at his tongue and tuned in a W2!

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The Berkshire Ether Busters is the name of a club recently formed in western Connecticut. Officers are W1BLQ, President; W1BTF, Vice-President; W1ATW, Secretary, and W1CQF, Treasurer. At present there are thirty members among whom are W1ADW, W1BNF, W1BTF, W1BRY, W1BIH, W1ATW, W1CQF, W1ALE, W1AVT, W1BMP, W1ASH, W1BEW, W1OS, W1AEQ, W1ATL, W1ARX, W1BLQ, W1CDN, W1VK and W1AYE.

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W7ACU is on Forestry Duty at Silver Creek Ranger Station (fire lookout), Enumclaw, Washington. Arriving there July 1st, he expects to stay until September 15th. He has taken his portable W7AQE along and will operate in the 3.5- and 7-mc. bands with dry battery supply. Contact is desired with as many amateurs as possible, so bear the call W7AQE in mind when listening on 3.5 and 7 mc.

A MISTAKEN IDEA

A few nights operation at W1MK indicates a fallacious belief that all A.R.R.L. staff members are instantly available at the station. True, staff members are often there, especially Communications Department personnel, but usually not more than one operator is present, and no sleeping quarters whatsoever. Headquarters station W1MK has telephone connections, is located at Brainerd Field, Hartford's airport, several miles from the new Headquarter's offices. Messages for any or all members of the QST A.R.R.L. staff are welcomed at W1MK for delivery at Headquarters next morning.

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W1BU calls attention to a misprint on page 39, July *QST*, where we list him as a Sweepstakes participant who did not submit complete data in accordance with the rules. The call should have been *W1AU*. W1BU did not take part in the contest.

A. L. Meggers of Opa Lock, Fla., advises that he will be on the air on Swan Island, in the Caribbean Sea, from August 1st to November 1st. He expects to use the call US in the 7000-kc. band, and would especially like contacts with Chicago amateurs. Meggers will be stationed at Swan Island for the purpose of keeping the U. S. Weather Bureau informed on the movements of tropical storms in that region. Amateurs are requested to watch for US and assist in every way possible.

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July *QST* (page 53) carried an account of amateur radio coöperation at the time of the Army Air Corps Maneuvers in New England. Since publication of that report we have received a detailed story of activities from the Springfield Radio Association. The operators in charge at the Springfield station, W1BWY, were W1AIF, W1BVR, W1DR, W1BPN, W1BCX, W1BVP, W1BAP, W1ASY, W1OF and W1BSJ. During the three days schedules were kept at W1BWY a total of 163 messages were handled. Among the amateurs at Boston who had a part in the coöperation was W1AOT, who relayed traffic from W1BWY to WVO.

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Attention is called to an error in the account of the maneuvers in the last issue. In our reference to the officers of the Springfield Radio Association we should have referred to Mr. Percy Noble, W1BVR as President, and Mr. Isaiah Creaser as Technical Chairman.

DIVISIONAL REPORTS

ATLANTIC DIVISION

SOUTHERN NEW JERSEY — SCM, Robert Adams, 3rd, W3SM — The Hamfest of the Radio Club of South Jersey held in the Walt-Whitman Hotel in Camden was a great success. There were 96 present from all over the East. Mr. Woodruff, our Director, was the main speaker. W3KW won the Station Description Contest with W3SM, W3QL and W3ZX finishing in the order named. Gedney Rigor, W3QL, was appointed Route Manager. W3AWV had a fine total this month. W3KW and W3ZI are new ORS. Your SCM attended the Atlantic Radio Club and talked to forty members. W3BEI is on the job as OO. W3ASG is active in Army-Amateur work. We welcome W3ARV to the ranks. W3ANP is rebuilding. W3BDO has many schedules. W3ATC is doing good work. The Morris Radio Club reports 36 members. W3JL, who is a musician, plays CQ on his fiddle.

Traffic: W3JL 76, W3ATA 18, W3AWV 201, W3BDO 11, W3UT 7, W3BCC 14, W3BGT 3, W3FU 68, W3BGF 103, W3AWT 2, W3BBD 42, W3BEI 30, W3KW 88, W3ACX 6, W3BLR 12, W3SM 793, W3ATC 27, W3ASG 77, W3ARV 29, W3ZI 37, W3QL 83, W3BUF 8, W3VX 24.

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Forrest Calhoun, W3BBW — Maryland: W3NY has been using reduced power, W3AOO is starting on a new 50-watt C. C. rig. W3AHG was reported in England. W3ZK is using a pentode for a doubler. W3AFF says nearly all of the hams are going swimming. W3BBW is trying to get the 'phone going. W3BND, W3WN and W3BLX are new stations. Delaware: W3HC turned in a nice report. W3BAK is a new ham in Laurel. W3ALQ has been too busy for any work. District of Columbia: W3CXL tops us all with a great total. W3BWT says his total might have been greater, but his antenna came down. W3BAT put up a new antenna. W3BKE sent in his first report. Well, this is about my sign off as SCM. Please give the new SCM the same coöperation you have given me. Let me thank you all for the fine help in making our Section one of the finest.

Traffic: W3CXL 1379, W3BWT 332, W3BAT 93, W3HC 55, W3NY 43, W3AOO 36, W3AHG 31, W3ZK 24, W3AFF 22, W3BKE 8.

EASTERN PENNSYLVANIA — SCM, Don Lusk, W3ZF — This being my last report I want to thank every one who has given me such splendid coöperation. All I can ask is that you continue to be as active in the future as you have been in the past. W3MG is going to remain active all summer. W8AIT has had to work evenings. W3ADE has a new National receiver. W3AKB keeps handling traffic.

W3OK will be off the air during August. W3UX reports hearing W8EA. W3QV has a schedule with W8EA. W3BET is rebuilding. W3GS pounds a mean fist when he is home. W3DZ is spending two weeks training cruise in the U.S.N.R. W3EV likes to chew the rag. W3OP has been trying for DX. W3AVI is getting started again. W3AQN is out for OO. W3BBK handed in a nice total. W3AQQ had bad school QRM. W8CFI is going to pound brass at WDAL this summer. W8VD will not be on until Sept. W3AAD will receive his ORS this month. W8EU says the ole gang up Williamsport way is getting all "het" up again. W3ZF is working a 14 mc. 'phone.

Traffic: W3MG 226, W8AIT 1, W3ADE 2, W3AKB 79, W3OK 63, W3UX 85, W3BET 28, W3GS 79, W3EV 39, W3DZ 56, W3OP 11, W3AVI 14, W3AQN 57, W3BBK 57, W3AQQ 51, W8CFI 51, W3AAD 132, W3ZF 58.

WESTERN NEW YORK — SCM, John R. Blum, W8CKC — W8CKI and W8BJO are our star traffic handlers this month with 1147 and 1042 respectively. FB. W8DES makes BPL with nice total. W8BYD reports new stations W8CHA, W8BDC, W8EPU and W8CDK. W8BYD, W8DSS, W8CZP, W8BHK and W8DHQ all make BPL! W8EDB is new ham in Bath. W8BYO says Rochester Unit, U.S.N.R., has new uniforms. Bob Mele of Syracuse reports, but gives no call. W8DME reports W8BWE, W8BDV and W8AWG back from active U.S.N.R. duty. Dr. Gillett of Hartford, N. Y., didn't include his call with report. W8DCX has installed rectobulbs. W8CDK reports for first time. W8ADG's gutter pipe antenna blew down. W8BIF, W8AFM, W8ON, W8BOM, W8DHU, W8DII, W8DXF, W8QL, and W8ACK report. W8DBX has a good total. W8KS is busy with WPDR, police station in Rochester. W8DEJ is at new QRA seven miles out in country. W8DSA has been starting chicken farm. W8BR will attend summer school at Ithaca. W8ABQ received request for schedule from G2XT. W2BZN will be at W8APK this summer. W8CSW hopes to summer at home in Wisconsin. W8BJI says he's busy with exams. W8BHU heard WSEA several times. W8AST is operating at WFBL. W8DWJ is experimenting with antennas. W8BLH handled traffic to Berlin through PAFLX. We have a splendid total this month, fellows. Let's keep up the good work and get that Banner!

Traffic: W8BJO 1042, W8CKI 1147, W8DES 446, W8BYD 370, W8DSS 351, W8CZP 228, W8BHK 190, W8DHQ 136, W8DBX 114, W8QL 109, W8BYO 78, Mele 64, W8DME 40, Gillett 38, W8DII 16, W8DCX 11, W8DHU 10, W8ON 8, W8AFM 7, W8CDK 7, W8ADG 6, W8BIF 4, W8BLH 2, W8BHU 3, W8BOM 11, W8BWY 74.

WESTERN PENNSYLVANIA — SCM, Robert Lloyd, W8CFR — W8BSE leads the section this month. W8DLG says the hot weather has slowed him down. W8CMP is going strong. W8AVY is dressing his transmitter up in a new rack and panel. W8DUT reports W8EUF is a new station in Vandergrift. W8APQ says, "Still too much music!" W8CEO will not rebuild. W8GU reports everything quiet in Erie. W8DXI is increasing power. W8BHN is on 'phone. W8CRA had a schedule with the yacht *Temptress*. W8CKO is helping W8BK rebuild his crystal transmitter. W8ESD is a new ham in Pittsburgh. W8BYE and W8DFA are both on the air. W8AIG is working a new crystal rig. W8DHW, W8AMY, W8JQ and W8COL are on irregularly. W8FJ is vacationing. W8BUC sends in a little traffic. W8AAQ reports some news. W8BRC and W8BVE are active. W8BFD has a new crystal on the air. W8LX sends in its first report. W8ASE has the same MOPA. W8DGW has his store teeth working now. W8BSO and W8CUG are playing with long antennae. W8CFR is hunting a South American schedule.

Traffic: W8BSE 559, W8DLG 282, W8CMP 77, W8CUG 46, W8AVY 10, W8AJU 9, W8DUT 9, W8APQ 5, W8CFR 2, W8CRA 52, W8CKO 50, W8FJ 19, W8BUC 4. W8LX 2.

CENTRAL DIVISION

MICHIGAN — SCM, Ralph J. Stephenson, W8DMS — Just back from D.A.R.A. picnic, where W8BG assisted by W8MV and W8CEV certainly handed everybody a good time. East Siders played ball with West Siders for a 5–5 score. W8AM and W8DYH were team managers. Contesting prize winners were: Men's race, W8EUV; Rolling Pin throw, W8AKN's Y.L.; Boys' race, W8DMS Jr.; Men's bag race, W8CAM; Needle-threading contest, Fred and Mrs. Miller, W8BUZ; Code, one-year licensed ops, W8ERX; Code, unlimited, W8DMS. Mrs. W8GP won the electric clock on registration number drawing. Picnic held at Bloomfield Park. W8RP is not in favor of hi-power holiday. W8EKI and W8EKT of Ann Arbor Fire Dept. are newcomers. W8MV keeps among top-notchers in A.R.R.L. net for American Legion. W8DNT totals suffer from heat. W8DDO QRL with orchestra. W8EKZ is a bear for traffic. W9AXE is coaching W9GPM. W8EGI is out for an ORS. W8DED is busy with his QSL factory. W8EAE is new traffic man in Holland. W8AJC is leaving us for college in Kentucky. W8DYH is still in the headlines. W8BMZ is using a.c. receiver. W8BJ keeps us posted on new traffic hams. W8CST is giving up traffic for the summer. W8DMR will be off while rebuilding. W8PP tops the section for this month. W8SH is closed down for summer vacation. W8JX says "Plop goes the 50-watter on the 13th message." W8BPL lives up to his call letters and hits the high spots. W9HK's business is "Developing" during the resort season. W8CFM, W8CLN, W8ECO and W8FM keep the 'phone band busy. W8EGN, W8QT and W8DLX are good outlets for West Mich. traffic. W8BMG, new R.M., is pepping 'em up over in western portion. W8AZ is now at WKZO. W8DBB is scrubbing crystals. W8DAQ is reported as navigating a tub on Lake Michigan. W8EAM is a new one in Paw Paw. W8BPT moved to Chicago and tried to get call W9OW, but the R.I. said she wasn't old enuf for OW, so gave her W9HGC. W8DFE is experimenting with new transmitter. W8CKZ, W8BTK, W8WR and W8GP all playing with 14 mc. W9EGF will burst out with an A-1 station as soon as re-vamping is finished. W8AUT stops in the midst of graduation work to send in report. W9GJX misread the date on her ticket, so had to observe silent "days" pending renewal. W8BJT sends in his first report. W8EBV and W8EGN are both new Muskegon stations. W8LU is experimenting with pentodes in P.P. W8FX decided to change his QRA. W8CAT has his hands full as secretary of the D.A.R.A. W8DMS is QRL Morse wire days and WJBK nights.

Traffic: W8PP 543, W8BMG 328, W8DYH 293, W8BPL 261, W8DMR 121, W8BJ 69, W9HK 60, W8BMZ 56, W8FX 52, W8BGY 49, W8EKZ 46, W9AXE 46, W8DED 44, W8CST 35, W9GJX 32, W9CAT 28, W8EGI 19, W8WR 15, W8JX 13, W8EBV 11, W8DMS 10, W8SH 10, W8DYH 9, W9EGF 8, W8CKZ 7, W8BJT 5, W8GP 5, W8RP 5, W8DNT 4, W8BTK 2, W8MV 2, W8AUT 2, W8DFE 2, W8EGN 2, W8DDO 1, W8LU 1.

ILLINOIS — SCM, F. J. Hinds, W9APY — (RM — E. A. Hubbell, W9ERU) Illinois is planning a State Traffic Net which will enable every traffic man to have an equal chance to do more handling and yet no one will be overworked. If you are interested, get in touch with W9APY at once. The Egyptian Radio Club had a fine Hamfest at Nameoki. W9ERU and W9APY like the new Hull Pentode Receiver idea. W9DGZ won the Sweepstakes in Illinois. W9BQA helped W9DGZ do the stiff operating. W9CYT has a new PP TGTP. W9CTP is rebuilding. W9FGD is attending Dodge Institute. W9FAU did some relief operating at WTAD. W9ATS is using his W9GSQ portable at Newton. W9ALA is one of our new ORS. W9ACE is running a QSO contest. W9KA has moved again. W9JO plans on using 1000 volts on rectobulbs soon. W9GYO is doing fine schedule work. W9GAI is building a 75-watt crystal outfit. W9FCW did some fine work in checking up his OBS Coverage Survey. W9FI bought a new car. W9DKF says QRN has thrown a monkey wrench into the machinery. W9GFU has changed QRAs. W9APY has another call in W9WR which he will use at another QRA. W9FTX wants to know why a fellow has to wait 1½ months for a renewal. W9CUH reports the crystal working in fine shape. W9GIV will be on shortly. W9AVB wants schedules with fellows on vacations who are using portables. W9FRA is using 2 '10s in Push-Pull. W9CNY has a new portable license, W9HEJ. W9AMO works W9ALA daily on schedule. W9ACU wants schedules on 7 mc. W9QI reports DX good. W9BNR says QRN is too bad for 'phone work. W9CN has gone to low power. W9FO

is trying to keep hams clear of the Navy 4045-kc. freq. Most of the big total of W9DZU was done on two days. W9CUX will be W9DWB in Indiana until fall. W9BSR says traffic has gone haywire. W9AFB says the air is dead in daytime now. Bad power leaks and QRN at W9DBE. W9CGC has bad QRN. W9PK continues to DX. W9KB has a few schedules. W9BIR is rebuilding and using new Zepp. W9FPN has new higher power and QRM. W9FXE is one of our new ORS. W9FGN says school is out. W9LL has been redecorating and fixing up a bit. W9AFN has not been on much because the rectobulbs went west.

Traffic: W9CYT 158, W9AMO 145, W9BNR 128, W9CTP 127, W9ALA 121, W9GAI 101, W9FRA 58, W9DGZ 55, W9ATS 53, W9ACE 52, W9FI 49, W9FXE 40, W9GYO 40, W9FCW 25, W9CUH 24, W9DZU 21, W9PK 21, W9DKF 20, W9BIR 18, W9FGD 18, W9AFN 14, W9APY 14, W9CGC 14, W9CUX 14, W9DBE 13, W9FAU 13, W9AFB 12, W9FGN 12, W9KB 12, W9QI 11, W9ACU 9, W9AVB 7, W9CN 7, W9AD 6, W9BSR 6, W9GFU 6, W9JO 5, W9FPN 1, W9FTX 1, W9GIV 1, W9LL 1.

OHIO — SCM, Harry A. Tummonds, W8BAH — We almost won another banner last month, losing by 19 points. Congratulations to Michigan! Here we are again with about 5200 total this report. Ohio had an entire new set-up last month with the state now divided into nine ORS districts with a Route Manager in charge of each. The new Route Managers and district numbers: No. 1 — W8DDS, No. 2 — W8BKM, No. 3 — W8AND, No. 4 — W8MH, No. 5 — W8NP, No. 6 — W8DU, No. 7 — W8CKX, No. 8 — W8CGS, No. 9 — Unassigned as yet. W8AXV is RM for 7-mc. band, and W8DDS also General Ohio RM. W8CUL has been appointed RM for all Ohio 'phones and has a 'phone traffic net already in operation. Ohio's bid for the BPL this month: W8DDS, W8CGS, W8EBT, W8DU, W8BKM and W8BAH. Russ, W8DDS, reports 1426. W8BRB, W8ENH, W8EFG, W8BFL, W8BGR apply for ORS. W8BNC is on 14 and 3.5 mc. W8BFA, W8DVE are new Cleveland ORS. W8UC is out for DX. W8AQX handled some USNR Cruise messages. W8US is off air until Sept. W8HT is an old-timer at Fostoria. W8BCI is busy. W8EEW is an officer in the Lakewood Radio Club. W8NP is getting out fine with new transmitter. W8ATV has been on the sick list. W8CX will be in Cleveland soon. W8EGZ has a new MOPA. "It's too hot," reports W8HH. W8BAC spent lots of time with Nellie last month, and has to rest now. Hi. W8DUD sends eight reasons "why." W8APT had a good report. W8CUR is building new 'phone. W8CNM reports by radio. W8BSR is on 14 mc. W8BTT is busy for summer. W8BBH is still trying to work on 14 mc. W8ARW is on 'phone and CW. W8CSS wants to know about Ohio Convention. W8EEQ schedules W8ENH. W8BKM has 6 schedules. W8CFT, W8CIY, W8DMK, W8LI report. W8DIH schedules W8DVE. W8BMA still has no shack. W8BYG is back with a Hartley. W8EXR, exW3BCT, is now on air at Ada. It all helps, W8DZH, keep up the good work. Always good totals from W8DKG. W8JJ is troubled with power leak. W8DU is out to win next month. Junior Opr. at W8DFR now has a ticket. W8AOJ is doing good work on 7 mc. W8EJ is the busiest ham in Youngstown. W8VP got new club started, call W8EWM. W8EXA was QSO with a ham with a portable transmitter in the Canadian Rockies. W8EBT has job on Str. Seeandbee from Cleveland to the SOO. W8CGS schedules W8BAH, W8DU and W8CUL. W8BMX is back in Cleveland. W8BZL says watch our smoke when the Akron gang get to Camp Perry with O. N. G., July 5. W8MH, RM, will try hard to put District No. 4 and OHIO on top. W8APC is back on air. Too much farming reports W8OQ. W8EGO and W8TH report for ORS. W8FA is now back at W9RS for summer. W8CKX is building new transmitter. W8UW is doing good work with temporary transmitter. W8AND has been busy redecorating store. W8CCK wants plenty of schedules for Camp Perry. W8ADS is down on 14 and 7 mc. for summer. W8RN is still on KKUI. W8JR is a real Old-Timer. W8BAH got his first 1000 total. W8TK is QRL on the river day and night. W8BDG is a new reporter from Akron.

Traffic: W8DDS 1426, W8BAH 1149, W8CGS 425, W8EBT 211, W8BKM 203, W8DVE 113, W8CCK 105, W8DU 97, W8CUL 92, W8CNM 112, W8BAC 105, W8MH 82, W8AND 80, W8AQX 77, W8CFT 63, W8HT 56, W8DFR 47, W8EGZ 49, W8VP 43, W8DMK 43, W8BTT 41, W8DKG 39, W8NP 38, W8BBH 33, W8BDG 32, W8JJ 28, W8BFA 27, W8BGR 26, W8ATV 24, W8CKX 22, W8JR 20, W8BNC 19, W8APT 18, W8AOJ 16, W8UW 15, W8EEQ 15, W8ADS 14, W8CSS 14, W8DZH 13, W8EGO 12, W8DIH 11, W8BMX 10, W8TH 10, W8AXV 9, W8TK 9, W8ENH 9, W8ARW 8, W8EJ 7, W8HH 6, W8FA 6, W8UC 6, W8BZL 4, W8US 3, W8BYG 3, W8EXA 1, W8BSR 1.

KENTUCKY — SCM, J. B. Wathen, III, W9BAZ — At a splendid Hamfest in Lexington, June 20th, the Watkin's 852 Trophy was presented to W9OX for high traffic man Jan.-June. He totaled 1286. The program also included a good talk on "Power Supplies" and a 56-mc. transmitter demonstration. Watkin's is to be congratulated upon his work. The most distant ham attending was W9FZL. W9BWJ's total would have been much larger, had he been on the full month. W9EDQ is keeping several schedules. W9BAZ took a trip south. W8AQV is moving his transmitter to a larger room. W9QT is building superhet. W9ACS and W9BEW are taking U.S.N.R. cruise. W9CEE goes speedboating. W9CNE moved transmitter. W9ERH wants to swap his '11D for an '03A, or sumpin'. W8BAN helped W8DQC build his new 'phone. W8ESQ comes through with his first report. W9CIS kept daily schedule to W9OX while Carl was fishing in Herrington Lake. Graduation speeches kept W9GJE rather busy. The hot weather is sweating radio right out of W9EYW. W9DDQ won the Sweepstakes Contest certificate for Kentucky. W9AEN is tutoring a ham-to-be. W9AZY says "RMNITE" was a "flop" for him. W9GGB got back from Virginia. W9HCO is rebuilding for 50 watts. W9FCH and W9FQQ are working schedule for Boy Scout Camp at Prospect. W9FZV has gone back to MOPA. W9ETD is now Kentucky's only 'phone OBS. W9EQO is in new QRA. W9CDA made some very attractive identification cards for those attending the Lexington Hamfest. Watch for broadcasts of special interest to Kentuckians from our OBS on regular schedules. Hamfest in Louisville in September — details later.

Traffic: W9BWJ 543, W9OX 404, W9EDQ 205, W9ALR 143, W9BAZ 117, W9AQV 114, W9QT 88, W9CEE 71, W9CNE 52, W9ERH 25, W9BAN 22, W9ESQ 22, W9CIS 17, W9GJE 13, W9EYW 12, W9ACS 9, W9DDQ 9, W9BEW 6, W9AEN 5, W9AZY 5, W9GGB 4, W9HCO 4, W9FQQ 2, W9FZV 1.

INDIANA — SCM, George H. Graue, W9BKJ — W9AET is 165 points ahead of the nearest competitor in the traffic contest. W9GJS is changing over to crystal. W9ESU slumped due to rebuilding. W9DOO and W9GYW are showing signs of activity. W9CKG has given up hopes of working DX. W8AET is playing checkers with W8DIH. W9GJG and W9ABW are two new promising ORS. W9AOO is crashing through with a 50-watter. QRN and DX don't mix at W9AXH. W9GYB has QSY to 14 mc. W9FRY has a 50-watter going on 3.5 mc. W9FKE, W9AIP and W9CWS are rebuilding. W9CMQ has a new 75-watter on 7 mc. W9FXM is building a portable receiver. W9EPH finally gets DC reports. W9CWQ is rebuilding between police tricks. W9BZZ has some new ideas for a receiver. W9EFV has gone back to MOPA. W9DHJ is putting in remote control. W9ABW reports change in QRA. W9GZB is new ham in Evansville. W9BZF is changing QRA. W9CHA goes begging for schedules. W9AKJ is now on 14 mc. W9HDB and W9HEH are new hams in Valparaiso. W9AEA is monkeying with pentodes. W9AHL is giving 7 mc. a whirl. W9ASJ is off the air until he lassos his stick with a piece of wire. W9ARK promises to come on with a half kw. 'phone. W9BWI's new 500-watt 'phone rig is nearing completion. W9DYQ is new ham at Selma. W9CLF is trying out new cond. mike. W9DAQ has changed to PP. W9DWL's making another complete change in the 'phone rig. W9AIN is unable to find time to move his transmitter back to Ind. W9UM has the highest score in the International Contest. The Indianapolis band is taking portable W9JP on their week-end outings. Ft. Wayne bunch are also having their week-end jamborees.

Traffic: W9AET 230, W9GJS 65, W9ESU 65, W9CKG

61, W9GJG 41, W9AOO 14, W9AXH 12, W9FKE 13, W9EPH 10, W9BWI 13, W9BWS 7, W9FRY 6, W9AIP 6, W9FYB 6, W9EFV 6, W9DHJ 5, W9ABW 4, W9CHA 2.

WISCONSIN — SCM, C. N. Crapo, W9VD — W9GFL has been using his portable on 'phone. W9FAW received QSL from HH7C. W9DKH and W9VD report. W9FAA was off awaiting license renewal. W9BIB visited W9GFL and W9ANR. W9EHD is experimenting with receivers. W9EPJ is changing QRA. W9ABM will be at Camp McCoy this summer. W9GYQ is building MOPA. W8BWV is building modulator. W9DCT is getting out well. W9AVG is crystal-controlled. W9FAF-W9HGA is a new station at Racine. W9HFH sends in his first report.

Traffic: W9GFL 241, W9FAW 38, W9DKH 27, W9FAA 27, W9BIB 16, W9EHD 4, W9EPJ 2, W9VD 12.

DAKOTA DIVISION

SOUTHERN MINNESOTA — SCM, H. Radloff, W9AIR — W9FFY garners his totals on 3.5-mc. band. W9BN's network of schedules perks daily. W9FJK is the most active non-ORS in the Section. W9AIR spends his holidays at the ol' swimming hole. W9DRG looks around for a 50-watter. W9CKU is happy in a renewed ticket. W9BNN aggravates his oscillator with a bug. W9AKN reports reception from WLY while experimenting on 28 mc. W9FNK has his '10s with the grids in push-pull and the plates in parallel. W9COS is enjoying a well-earned vacation. W9EYL says ham set gets attention only between the job and the car. W9EFK rejoices in a baby daughter, Congrats. W9DBC deserts the set for golf and swimming. W9FLE is developing a new tuner. W9EJR reports an inspiring visit by W9BGG. W9BKK wants to run some 56-mc. experiments. New stations in the Section are W9HCW at Lamberton and W9HGN at Mpls. W9BQF received a ZL card. W9FDX reports material for new hams at Clarkfield. Sex appeal is diverting W9EEB's attention from power and filter problems. W9FMB vacations in Iowa. W9BKX spent a good deal of his time in Chicago. YLs also account for W9EYS' absence. W9GLE and W9GMD like their fishing. The Jackson gang have been hamfesting. W9DWG reports testing with W9BMJ on 3.5-mc. cc. 'phone. W9BHZ is sampling some of Minnesota's lakes for the biggest fish.

Traffic: W9FFY 230, W9BN 86, W9FJK 34, W9AIR 29, W9DRG 24, W9CKU 10, W9BNN 6, W9AKN 6, W9FNK 6, W9COS 5, W9EYL 2.

NORTH DAKOTA — SCM, Guy L. Ottinger, W9BVF — W9IK is going to school at Valley City this summer. The Jamestown gang had a visit from W9CRL. W9DFF is constructing an MOPA. W9DGS is still getting the Net for American Legion BCs. W9DM is out at a camp with a bunch of Boy Scouts. The dust was blown off of W9BVF and the old outfit spoke right up and worked a VK.

Traffic: W9DGS 56, W9BVF 11, W9DFF 6, W9CRL 5.

NORTHERN MINNESOTA — SCM, Raymond Weihe, W9CTW — W9FNQ leads the Section this month. W9FQI has a promotion in the AA work. W9BVM reports a new station with the call W9HFX. W9DOQ is getting a WAC. W9HDN is a new reporting station. The SCM is rebuilding. W9FNJ is experimenting with PP. W9BRA says W9HED of his city has a commission in the V-3. W9BYI is a DX Hound. W9EOZ was home for a short vacation. W9BVH plans a trip to N. Y. C. W9GKM is arousing the sleeping BCLs with a 1750-kc. 'phone. The newly formed St. Paul Radio Club now has a membership of 18.

Traffic: W9FNQ 32, W9FQI 23, W9BVM 10, W9DOQ 7, W9HDN 6, W9CTW 4, W9FNJ 4, W9BRA 4, W9BYI 2, W9EOZ 2.

SOUTH DAKOTA — SCM, Howard T. Cashman, W9DNS — W9ALO is carrying three schedules. W9EZJ visited W9ALO. W9GWR is a new station. W9DB reports heavy QRM. W9FLI's license expired. W9EUH spent a week in Sioux Falls. W9DES has been lighting up the neighbors' houses. W9DRB is leaving for Willmar, Minn. W9DIY has annexed a pentode. W9DTZ, W91D and W9AJP are still breathing. W9DNS is on with one lung. W9TI is building.

Traffic: W9FLI 1.

DELTA DIVISION

MISSISSIPPI — SCM, William G. Bodker, W5AZV — Our leading traffic handler this month is W5BHL, who handles most of his traffic via 3500-kc. 'phone. W5ANX's 3500-kc. 'phone is heard regularly. W5AWP has been appointed OBS and will use 3500-kc. 'phone. W5AZV and W5ANI are having a little YL QRM. We are sorry to note that W5BUI of Vicksburg is selling out. W5BOM has succumbed to the wiles of Cupid. W5BNW is following him fast. W5VJ is "Sold" on his new MOPA. The Jackson Amateur Radio Assn. is operating portable station W5BJO at the Kickapoo Boy Scout camp, 15 miles from Jackson. A nice letter was received by the SCM from the hams at A & M College, who operate W5YD. The entire staff of W5BHL except W5BOM left recently for Mobile, Ala., where they will go on a three-day cruise in the Gulf of Mexico with W5AQO, W4RS, W4IA and others.

Traffic: W5BHL 60, W5BJO 44, W5AWP 14, W5BOT 10, W5AZV 6.

ARKANSAS — SCM, Henry E. Velte, W5ABI — Take a slant at the traffic total of W5BMI. W5IQ is busy with the Army Net. W5ABL, W5BDW and W5BED are new stations in L. R. W5AYJ is a new reporting station from Ft. Smith. W5AY is getting out nicely. W5BKB is rebuilding. W5ABI is on 7 mc.

Traffic: W5BMI 526, W5ABI 325, W5IQ 206.

LOUISIANA — SCM, Frank Watts, Jr., W5WF — W5BDJ has a new AC receiver. W5BPN has a new MOPA. W5BKL has a well-developed case of YLitis. W5WF received his Sweepstakes Contest certificate. The SCM is at W5VT during the summer. W5VC is a new 'phone op. on 1715 kc. W5ML is rebuilding.

Traffic: W5WF 211, W5BUK 31, W5AXU 10, W5BPN 2.

TENNESSEE — SCM, James B. Witt, W4SP — W4OI sends in the best report this month. W4AAD is our traffic handling station. Most of the Knoxville gang including the SCM got their photos in the Knoxville News Sentinel with a full-page write-up this past month.

Traffic: W4OI 24, W4AAD 20, W4CW 10, W4RO 6.

HUDSON DIVISION

NEW YORK CITY AND LONG ISLAND — Acting SCM, Wm. J. Warringer, W2BPQ — Have cancelled four ORS for non-reporting and appointed four new ones in their places, W2CWP, W2BJF, W2CBB and our YL W2WP. Manhattan: W2SC is installing new 500-watt job. W2BDJ is working on his new Radio Club. W2AVK is all set now. W2BZN is going home to W8APK for the summer. W2CKS has a new junior op., arrived on Friday, the 13th. W2BNW has applied for an ORS. W2AOU is now an Army Amateur. Bronx: W2BGO has gone back to the ole reliable Hartley. W2CYX is back from a 15-day cruise with Naval Reserve. W2BPQ let his call expire so as to try and get a two-letter call. W2LW has slowed up for the summer. W2CWP has his crystal rig finished. W2AFO has gone on inactive list. W2CBB, new QRA, 417 West 238th St., X2ANE, has been rebitten. Brooklyn: W2PF is going full blast, now that school is over. W2AZV is kicking about heat in attic. W2BJF is working on 14-mc. rig. W2BRB is busy with research work. W2APK requests transfer to inactive list. W2CA has joined the Army Amateur system. W2BO has new transmitter. Long Island: W2BDN blew his whole layout. W2AVP — slow month. W2HO is recovering from operation. W2BFG opened up Decoration Day. W2AVJ worked Asia. W2CWJ insists that he is not Uncle Haywire. Staten Island: W2WP, our YL, wants to a be Comm. op. W2CEP is building a push-pull rig. W2CHT has a 50 going now. W2BDP is op on boat to Honduras. W2CKN is looking for schedules. Staten Island Radio Club is ready to handle traffic from club room.

Traffic: Manhattan — W2SC 217, W2BDJ 41. Staten Island — W2WP 36, W2CKN 5. Bronx — W2BGO 86, W2CYX 79, W2BPQ 11, W2LW 9, W2CWP 3. Brooklyn — W2PF 54, W2AZV 18, W2BJF 7, W2BRB 5, W2BO 44. Long Island — W2BDN 39, W2AVP 12, W2BFG 2.

NORTHERN NEW JERSEY — SCM, A. G. Wester, Jr., W2WR — W2JF is having trouble to get traffic.

W2AOS has moved into the same town as your SCM. W2CWK and W2WR have filed their ORS for the summer. W2AGX is collecting data on antennae. W2CJX had a fine schedule with Hawaii. W2BPY is going to prep school. W2MQ has taken a few week-end trips on the Eagle boat No. 55. W2CDQ goes into the BPL. W2AIF has been elected Secretary of the newly organized Northern Valley Radio Assn. W2AKC-W2AMT is building a 500-watt outfit. W2CVY, our OO, has checked out for the summer. W2CNA has luck in getting QSLs from Russia. W2ZZQ is the portable call for W2AQI. W2CLX has been having fine success. W2BSC, Stevens School of Tech., is operated by W2AFV, W2AVS and W2ADB. W2BYX has a schedule with CM2PA. W2AOY from NYC has moved to Allenhurst for the summer. W2AGK has applied for ORS. W2BJZ is fooling around with MOPA. W2ADP received a card from India. W2BAP is riding 7-mc. QRM. W2BPV is planning to open up in the heart of Chinatown. W2CJO has joined the army of rebuilders.

Traffic: W2JF 32, W2AOS 42, W2CWK 6, W2AGX 2, W2CJX 10, W2BPY 32, W2MQ 150, W2CDQ 114, W2AKC 46, W2AQI 5, W2CLX 12, W2BSC 20, W2BYX 6, W2AGK 15, W2BJZ 1.

MIDWEST DIVISION

NEBRASKA — SCM, S. C. Wallace, W9FAM — W9BEX leads the procession. W9EYE is a new ORS. W9GDL, another new ORS, is going strong. W9FWW says traffic scarce. W9EHW and W9FUW have the rebuilding fever. W9BQR and W9DTH have the HOOK-WORM till next fall. W9BOQ can't handle a plow and radio at same time. W9DI, W9ESY and W9EKT report. W9FAM has bad case of chirpitis and key-thumps, and OW presented him a new ham. W9EWO is straining his ears for some traffic. W9GKZ is pounding away. W9DHA wants to organize Radio Club at Grand Island. W9DHC is pretty busy editing TSARC Bulletin.

Traffic: W9BEX 254, W9EYE 142, W9GDL 49, W9FWW 21, W9FUW 10, W9ESY 4, W9EWO 3, W9GKZ 34, W9DHA 11, W9DHC 35.

IOWA — SCM, Geo. D. Hansen, W9FFD — W9IO leads the field this time. W9FFD squeezes in with the next highest, Director Kerr and Lt. Hayden P. Roberts among the list of visitors. W9GP comes next and also sends list of visitors such as W9BNC, W9BNT, and W9DXY plus family. W9BJP reports his totals cut short by new car and YLs. W9DIB got his first report from VK. W9FZO is going strong on 14 mc. W9DFZ is QRL Pharmacy. W9FYC says all schedules cancelled. W9BCL worked HH7C. W9ACL gets a few. W9DPO is going strong in A.A.R.S. W9DJX is a first reporter. W9DNZ is QRL business. W9EJQ gets a few now and then. W9FEB is rebuilding. W9DUN is QRL golf. W9AHX awaits renewal of license. W9GOQ gets a couple. W9FWG has been on the sick list.

Traffic: W9IO 61, W9FFD 55, W9GP 34, W9BJP 27, W9DIB 25, W9FZO 24, W9DFZ 22, W9FYC 19, W9BCL 19, W9ACL 17, W9DPO 15, W9DJX 11, W9DNZ 8, W9EJQ 6, W9CWG 5, W9FEB 3, W9DUN 2, W9AHX 3, W9GOQ 2.

KANSAS — SCM, J. H. Amis, W9CET — W9ESL leads in traffic. W9FRU reports for the first time. W9BNX is one of the 'phone gang who is "traffic minded." W9JA will sign W9BTG until school starts in the fall. W9HL reports bad weather. W9CXW is busy. W9ESW is a telegrapher by day. W9GCL is in the regular Army and operates at WVC. W9CFN reports little activity. Your SCM is looking forward to meeting all of you at the Topeka Convention, Sept. 5 and 6.

Traffic: W9ESL 95, W9FRU 13, W9BNX 56, W9JA 15, W9HL 10, W9CXW 16, W9ESW 13, W9GCL 15, W9CFN 38, W9BGL 16.

NEW ENGLAND DIVISION

MAINE — SCM, J. W. Singleton, W1CDX — W1ATO is high this month. W1AJC comes next. W1BIG has a good string. W1BEU reports a new ham in Waterville, W1BOC. W1EF won the Sweepstakes certificate for Maine. W1BLI, RM for Eastern Maine, is on 14,000 kc. mostly. W1AQL says traffic is pretty slow up his way. W1AQW is rebuilding. W1BFA has at last eliminated his key clicks. W1AFA reports traffic. W1QH won't be on much this summer. W1AFR has a new AC receiver. W1BX has started a radio club at Crosby High School. Among the members are W1AXJ, W1BJY and W1BYV. W1AXY would like some schedules. W1CBM will soon be on with a new transmitter. The SCM thanks the Maine gang for the many congrats received, and will try hard to justify them.

Traffic: W1ATO 163, W1AJC 141, W1BIG 85, W1CDX 75, W1BEU 16, W1BLI 16, W1AQL 14, W1AQW 8, W1BFA 7, W1QH 2, W1AFR 1, W1AFA 14.

EASTERN MASSACHUSETTS — SCM, Miles W. Weeks, W1WV — W1BGW won the Handbook last month in the Conn.-E. Mass. Message Delivery Contest. W1CHR is using his portable, W1BOV, during the summer. W1BZQ reports his new transmitter working FB. W1KY finds little time for traffic. W1CCP has a new 3.5-mc. Zeppelin antenna. W1ADK has been doing some 14 mc. DX. W1BXB installed the radio equipment of WCEN on which W1TL recently left for Labrador. W1AAT has rebuilt his transmitter. W1AFP was QSO Brazil on 14 mc. W1BCF visited the SCM. W1WV also had a visit from CM2SH. W1AHX and W1WV handled traffic with NAMS, U.S.S. *Nantucket*, as she was entering the Mediterranean. W1KH has a new 14-mc. Herts. W1BFR handled some traffic. W1BNJ was QSO Europe and South America on 14 mc. W1AKY blew a 2000-volt condenser. W1BSZ has ORS ambitions. W1ANK hopes to be permanently settled soon in Gloucester. W1ASF handled Army-Aircraft traffic. W1AZE continues with 14 mc. DX. W1LM is vacationing. W1ATX finds traffic scarce on 3.5 mc. W1CQN has built an AC receiver. W1AAL has a schedule with W1AOP. W1ABG was QSO Uruguay. W1ACD has been QRL graduating from High School.

Traffic: W1ASF 210, W1AFP 84, W1BGW 83, W1KH 53, W1AAT 39, W1BZQ 37, W1WV 36, W1ATX 24, W1AZE 23, W1CCP 23, W1AAL 22, W1CQN 17, W1BFR 15, W1CHR 10, W1BCF 10, W1ADK 7, W1ABG 6, W1ACD 3.

NEW HAMPSHIRE — SCM, V. W. Hodge, W1ATJ — Watch for W1BBF's portable, W1CWO. W1AEF expects to have a portable also. W1IP says summer QRM got him at last. Hi. W1UN is away in the White Mts. most of the time now. The BCL trouble at W1AUY has been fixed. The 2nd op at W1LY is away on a 3500-mile motor trip. W1BFT graduated from NHU. W1CCM is feeling lots better. W1CLT is a new station in Dover. W1BAC handled a few. W1AXL is getting out well.

Traffic: W1IP 42, W1UN 18, W1BAC 6, W1AXL 6, W1AEF 2, W1AUY 1, W1BBF 16.

CONNECTICUT — SCM, Fred A. Ells, Jr., W1CTI — W1MK is the only station making the BPL this month. W1BEO is keeping four schedules. W1BDI keeps a schedule with WCEN — schooner *Ramah*. W1ES handled copy from WSEA. W1AZG complains of AC notes on 14 mc. W1CJD's '66's went west. W1BHM keeps daily schedule with Germany on 14,300 kc. W1AVB has been rebuilding. W1ASP is getting ready to rebuild. W1AFB say lots of 14 mc. DX. W1AOK dropped to 14 mc. W1AMQ is out of work. W1HQ works good DX on 14 mc. W1BNB remembered to report. W1BAZ sends in his first report. WTD put up some new feeders. W1CDS says swimming, golf and tennis keep him busy. W1ADJ is rewiring the club house for the Conn. Brass Pounders Assn. W1AXB says not much doing. Bill Stemple sends in a report. W1AGT is off rebuilding. W1AMG is moving to Stamford. W1HD is experimenting with 56-mc. CW and 'phone. W1CTI has been busy with the new house. W1FL made a trip to Chicago. Conn. Brass Pounders Assn. meets every Thursday evening at their club house in Noroton (on the Post Road). All welcome.

Traffic: W1MK 707, W1BEO 74, W1BDI 45, W1ES 44, W1AZG 36, W1CJD 27, ? 25, W1BHM 20, W1AVB 19, W1ASP 18, W1AFB 18, W1AOK 16, W1AMQ 14, W1HQ 10, W1BNB 10, W1BAZ 9, W1CTI 5, W1TD 4, W1CDS 4, W1ADJ 4, W1AXB 2, Stemple 6.

VERMONT — SCM, Clayton Paulette, W1IT — W1CGX is high traffic man. W1ATF turns in fine report. W1AXN and W1AOA report with traffic. W1BD has new

Zepp and Dynatron frequency meter. W1IT is inactive for the summer.

Traffic: W1CGX 105, W1ATF 64, W1AXN 24, W1BD 19, W1AOA 13.

WESTERN MASSACHUSETTS — SCM, Leo R. Peloquin, W1JV — The Berkshire Brass Pounders held a very successful hamfest at Pittsfield on June 20th. W1AWW is in line for reappointment as ORS. W1ASY reports fine DX. W1APL handles his share of traffic. W1BNL has reduced power to a single '10. W1NS and his gang from the Blackstone valley made several visits recently to Worcester, Northampton, Springfield and Webster. W1BVP has blown another high voltage filter condenser. W1ASU, W1BDP, W1AM, W1BNL and W1BKQ are on regularly. W1BKS reported.

Traffic: W1BWY 163, W1NS 110, W1ASU 72, W1DR 57, W1AIF 41, W1BUP 29, W1AMI 25, W1ATB 24, W1ASY 23, W1BNL 16, W1APL 16, W1BKS 2, W1JV 12, W1AJD 4, W1BKQ 3, W1AWW 51.

RHODE ISLAND — SCM, N. H. Miller, W1AWE — W1CAB still holds up in high traffic total. W1MO is on 14 mc. W1BUX won the Sweepstakes certificate for R. I. W1ATM is pushing out a nice signal. W1GV says weather is too good for radio. W1EX, W1FU and W1AWE did Naval Reserve duty at NGO. W1BDQ is now located in Riverside. W1AUV and W1AFO are doing BCL service work. W1DZ gets out FB. Her ops are W1AMD, W1CNZ, W1BML and W1BOP. W1ASZ was reëlected President of the Pawtucket High School Radio Club. W1BTP has three more licensed hams. W1BGA now uses crystal control. W1AMU is the chief operator at WPAW. W1AAD likes ham radio, but not at this time of year. W1CPV has a schedule with W8DTE. W1CDI gets out well on 3.5 mc. W1JJ and W1RJ are doing FB. W1SY gives the BCLs service. W1BQD is pushing out on 14 mc. Newport is all for 14 mc., as W1AFI and W1MG both are down there. W1DW works for the telephone company. W1AFO is working nice DX on 14 mc.

Traffic: W1CAB 42, W1AWE 29, W1AMU 13, W1ASZ 10, W1CPV 7, W1MO 6, W1ATM 6, W1AFO 10.

NORTHWESTERN DIVISION

IDAHO — SCM, Oscar E. Johnson, W7AKZ — W7BEO is a new station at Sandpoint. W7AUR is rebuilding. W7BAA, W7ANA and W7AYH report for the first time. W7KG is looking for DX. W7FB, W7AOO and W7AIH are all seeking DX on 14 mc. W7ACP is the editor of *The Idaho Center Tap*, a new ham magazine. W7AKZ is experimenting with pentode audio systems. W7ALW blew up his plate transformer. W7QD wants OBS appointment. W7AYH, ex-W7ABQ, is located at Boise. W7AFT has a new trick of maintaining a "one-way" schedule. W7AT is at National Guard encampment.

Traffic: W7AYH 2, W7KG 12, W7ANA 6, W7BAA 6, W7AUR 6, W7BEO 4, W7AKZ 10, W7AFT 18.

MONTANA — SCM, O. W. Viers, W7AAT — W7ASQ reports W7BFA a new Helena station. W7CU has been busy at the garage. W7HP is back in Miles City. W7FL is working in Big Timber. Among visitors at the SCM's station were W7AKO, W7AFY, W7ARP, W7BDC and W7JC, all of Billings, W7BAL of Gebo, Wyo., Route Manager W6BYH of Merced, Calif., ex-7CK of Roscoe and a few curious BCLs. W7AHF will soon have a new antenna.

Traffic: W7ASQ 15, W7CU 9, W7HP 6, W7AAT 5, W7AHF 1.

OREGON — SCM, W. S. Claypool, W7UN — W7AWH again tops the list. W7ED was laid up in the hospital a portion of this month. W7ALM comes through as usual. W7ZD is Portland's champ. W7QY will stand a two weeks' operating watch at NDQ. W7MY built an MOPA. W7PE reports. W7AMF is putting in his new crystal set at the Hoby Show in Coos Bay the first of July, in the name of the Coos Bay Amateur Radio Club. W7WL was the host to Col. Foster. W7APE isn't heard so easily. W7ANU and W7AYJ report for the first time. W7SY has low-powered local 'phone. Hereafter send reports to F. L. Bernhardt, W7WL, 2787 Sheridan St., North Bend. He will act as SCM until an election can take place.

Traffic: W7AWH 253, W7ALM 123, W7AXO 10, W7ED 165, W7QY 30, W7ZD 114, W7MY 34, W7PE 31, W7AMF 30, W7WL 25, W7APE 17, W7SY 16, W7AYJ 26.

WASHINGTON — SCM, Eugene A. Piety, W7ACS — W7QI takes the lead this month. W7AIB runs a close second. W7KZ has raised his power to 50 watts. W7AIT and W7TX are keeping schedules with Alaska. W7AVM and W7OI are new ORS. W7FJ is busy. W7AG-SL keeps the ether hot. DX is good for W7RT. A new SC station is W7ABN of Hoquiam. W7AXL, W7BCS, W7ATH and W7AVN report for first time. Things in Yakima are slow now according to W7ADS. W7IQ built a new super. W7AAX is busy working DX. A new '60 crystal job graces the shack at W7KQ. W7MX is busy at the berry fields. W7BG pounds brass occasionally. The YLs keep W7ACY busy. W7TK has been laid up with a bad foot. W7AOM is a YL op in Olympia. W7BB is still at sea.

Traffic: W7QI 97, W7AIB 94, W7AIT 40, W7TX 39, W7AYO 38, W7KZ 36, W7ATH 24, W7RT 16, W7AVN 12, W7AG 11, W7AUE 8, W7FJ 3, W7ADS 3, W7AVM 2, W7BCS 2, W7AQ 1, W7AXL 1.

PACIFIC DIVISION

SAN FRANCISCO — SCM, Clayton F. Bane, W6WB — W6AVH leads off with a bang with 566. W6EKC makes the BPL both ways. Old W6DFR comes right along in third place. The personnel at W6ZS (Ken and Dave) just arrived home from their vacation in time to report. W6CAL is now home from school. The gang at W6YO grace these columns for the first time. By some mysterious quirk of the gods we have a report from W6ERK. W6MV reports as usual. W6BJM wants to get lined up with some hot S.F. schedule. CONVENTION! SAN FRANCISCO! SEPTEMBER 5 AND 6, 1931!

Traffic: W6AVH 566, W6EKC 215, W6DFR 194, W6ZS 117, W6CAL 59, W6YO 55, W6ERK 37, W6MV 24.

SACRAMENTO VALLEY — SCM, Paul S. Farrelle, W6AXM — W6AIM says that 7000 kc. is "lousy" as compared to a few months ago. W6CMA turns in a very nice total. W6EJC has a very nice YL. (Hi) W6EOC is busy as OO. W6EOU is now WAC. W6QT has been rebuilding. W6BYB is new OBS. W6DON is looking back on the time when he was a ham. W6DKW says not much traffic. W6DYF is heard quite often. W6CKA is working his crystal outfit. W6AK and W6FW at Walnut Grove are heard on 3500 kc. with beautiful crystal DX notes. W6ADS is handling some traffic. W6AXM has added a Mrs. W6AXM to the household.

Traffic: W6AIM 21, W6CMA 64, W6ADS 20, W6AXM 1366.

EAST BAY — SCM, J. Walter Frates, W6CZR — W6ASH leads the gang in traffic with a splendid total. W6CTX came out of his retirement this month to bat himself into second place for the section traffic. W6CGM is back in traffic work again. One message he handled was for the American Red Cross in New Orleans and concerned a vital illness. W6RJ reports that since he has ground his transformer and choke cores and negative in power supply his high C Hartley gets crystal control reports. W6BPC reported a large batch of traffic this month. W6BI also reports considerable traffic. W6BZU says things are very quiet in his part of the section. W6FAJ has reverted back to the old TNT circuit. W6CBE announces that he will be off the air for the summer. W6BJI has worked practically all the western territories of the United States, including Alaska, Hawaii, and P. I. W6BMS has not been on the air for six weeks because of vacation. W6CZN has an a.c. receiver. W6BQB reported for the first time. W6ZM is putting out a section traffic bulletin with schedules and everything. W6ATJ is president of the new club. The East Bay bunch expect to have everybody in northern California here for a big trisection hamfest on August 1. The Santa Rosa gang this month had a feed and gathering at Santa Rosa which was FB thanks to the cooking of W6ADM's wife and another ex-YL. The call of the new club is W6YAJ and they are on the air for traffic. Plans are being made for a north east bay section meeting in Vallejo some time during the latter part of

August. W6ADM is building to 75 watts. W6AOH is very active. W6DTQ is off the air. W6EZA went to sea.

Traffic: W6ASH 804, W6CTX 214, W6CGM 89, W6RJ 56, W6BPC 46, W6BI 43, W6BZU 26, W6FAJ 21, W6CBE 21, W6BJI 18, W6BQB 10.

LOS ANGELES — SCM, H. E. Nahmens, W6HT — It's in the bag, men, IT'S IN THE BAG! If you haven't already been contacted for the greatest traffic tie up in our history and are interested, drop me a line NOW. (Note to Ohio Section.) You've got another think coming if you think you have no competition. W6EGH, W6QP, W6SN, W6BPO and W6YAU make the BPL. W6SN has increased his voltage from 750 to 2000. W6QP after a year and a half of solid work has signed off until September 1st. W6YAU has 32 schedules per week! Don't let those YLs interfere with your fine totals, W6DER. W6ETJ handled a flock of traffic to Governors concerning Fiesta de Los Angeles. W6EGH received 7 mc. heard cards from Switzerland and England. W6CFN follows up with another good report. W6ERL spent a two weeks vacation at NPL. W6TE was QSO B7X, a ship off North Africa and FX7C. QRA? The final amplifier at W6DVA now has pair of '52s in push-pull. W6AIX finally crawled out of his shell and sent in a report. W6AVJ worked schedule with WCEE. When it comes to burning up equipment we concede the prize to W6DEP. Many thanks, W6UJ, for the report. W6CVV handled traffic from the Farm Center Fair. W6DLI says his new super is a Wow. W6DH, a real "dyed in the wool," returns to the flock. W6LN visited northern clubs on his vacation. W6BPO is high point station this month. VCR U.S.N.R. takes great deal of W6BGF's time. Exams and graduation have hampered W6EGK lately. W6ACL is proud holder of commercial second ticket. A "spanking new" junior op at W6ZBJ has things all gummed up. W6WO just received W7AOU for the seventh district portable. W6ESA says "Whoopie! School's out!" W6CMU wants an ORS. W6TN is now crystal controlled. W6CXW built new 14 mc. Hartley to hook England. W6ANN heard eight European countries and worked just eight less than he heard. The president of the ARALB is W6VH. W6ALQ may be little slow but he doesn't QSP traffic to the waste basket. W6BVZ has had fierce power leak for six months. Page W6MK! W6DOZ sez DX fine but traffic nil on 14 mc. W6AKD has new shack. W6AEO using pentodes in both receiver and transmitter. W6CUH now using 200-foot single feed Herts. W6AZL blew his 211 so uses '10 in final now. If the heap at W6MK NEVER gets on air, it's really worth a night's sleep just to LOOK at it. W6VO is rebuilding by degrees. W6BZR and W6EBO are starting out right by making schedules. W6BCK has new a.c. receiver. W6DHM, the fisherman op, stands watch at W6DVA when not at sea. W6BEB is shoving five gorgeous amps to his zepp with beautiful new transmitter. The whole section was shocked by the death of Everett Trout, W6FJ, who was killed in an automobile accident May 27th. The Riverside Amateur Radio Club has applied for A.R.R.L. affiliation. Information on meetings obtainable from W6DLV, Secretary. The A.R.R.C. is having worth while meetings regularly now. They sponsored the quarterly banquet June 27th. W6CZT, W6EWI, W6CZI, W6ON, W6EQD and W6DNA report. Your SCM looks forward to seeing all of you at the convention in Frisco, September 6th and 7th. 73.

Traffic: W6BPO 645, W6SN 371, W6QP 220, W6YAU 217, W6DER 158, W6ETJ 149, W6BCK 113, W6EGH 109, W6CFN 101, W6ERL 83, W6DH 80, W6LN 76, W6TE 73, W6EBD 70, W6CVA 48, W6AIX 44, W6AVJ 44, W6DEP 41, W6UJ 40, W6CVV 38, W6DLI 38, W6BGF 33, W6EZK 34, W6ACL 23, W6CZT 22, W6ZBJ 17, W6WO 17, W6EWI 16, W6DZI 12, W6BZR 12, W6ESA 10, W6CMU 10, W6TN 10, W6CXW 9, W6ANN 8, W6VH 7, W6ON 6, W6ALQ 6, W6BVZ 5, W6DOZ 5, W6AKD 4, W6EQD 4, W6AEO 3, W6CUH 3, W6AZL 2, W6DNA 2, W6AKW 163, W6DWW 7, W6AM 44, W6MA 2, W6ZZA 2.

SANTA CLARA VALLEY — SCM, F. J. Quement, W6NX — W6YG handed in another record breaking total of 665 messages. With W6AMM, W6BET and W6DMJ taking over W6HM's PI schedules for the summer, it looks like there will be no interruption to this important traffic. W6FBU is leaving the section, having graduated from Stanford. W6AJ is helping the traffic contest along by consistent traffic, being followed by W6FBW, W6BPT, W6CEO, W6DBB and W6DCP. W6BHY handled some important newspaper despatches when he gave the world first hand information regarding Ft. Hubbard's forced landing in Alaska. W6AHZ is QSO Europe on 14 mc. W6AGJ, W6BON and W6DMM are keeping the 3.5 mc. 'phone channel busy. W6NX is building a new shielded receiver.

Traffic: W6YG 665, W6HM 306, W6AMM 125, W6BET 94, W6DMJ 91, W6BFU 36, W6AJ 41, W6FBW 21, W6CEO 20, W6BPT 6, W6DBB 15, W6DCP 2, W6NX 3, W6ALW 75.

SAN JOAQUIN VALLEY — SCM, E. J. Beall, W6BVY — W6AOA again takes the lead in traffic. Maxey of Tulare came through with a nice report. W6ASV is QRL with public address outfit. W6CCW is getting hot for 'phone. W6EKH handed in his first traffic report. W6FFP comes through with a good report. W6ETN is on the job as OO. W6QA got the sad news that his job will be shifted elsewheres. W6YB has new 50 watter going. W6AAY is a new man in Modesto. W6EAR and W6EXM are heard regularly. W6AME is monkeying with a portable. W6BFH has a nice signal on 3500. W6DCI is still in Reno. W6EFP has a nice d.c. sig. W6COJ is back from his fishing trip. W6BRV finds 14 mc. FB. W6FV has a nice 'phote. W6CXT continues to handle much traffic. W6AV leaves for Yellowstone Park the last of June. W6BQC and W6BBS, the YL op of Wasco, continue to keep that city on the Ham map. W6BJE is arranging to handle Boy Scout work. W6BVY is busy recruiting men for U.S.N.R. W6AHO summers in the mountains as a forester. We hope W6WA will be back on again soon. W6DQV handed in a nice report. W6BUZ reported.

Traffic: W6CLP 14, W6AOA 440, W6BJE 6, W6DQV 40, W6FFU 5, W6YB 3, W6AV 29, W6FV 12, W6BUZ 7, W6EKH 9, W6BQC 68, W6CXT 42, W6ETN 6.

ARIZONA — SCM, Russ Shortman, W6BWS — This report is furnished by Bob Lockhart, W6EEB. W6BJF has been elected SCM to succeed W6BWS. All future reports should be sent to him. W6CPF leads the gang in traffic this month. W6EUT and W6EFC are next in line. W6CBA is a new ham in Ajo. W6CVR and W6CAP installed 'phone transmitter at U. of A. in connection with engineering show. W6BTV and W6BHC also had a hand in the installation. W6AWH is building new shack. W6DIE is taking W6DJH's place at KOY while latter is on vacation. W6AEK is new 3.5 mc. 'phone. W6BLP is rebuilding. W6CCN is busy servicing BCLs. W6AND sports a new fifty watter. W6DSA is the Boy Scout camp at Payson. W6BYD works W6DSA on schedule. W6CEC handled his traffic via 'phone. W6DWP lost his call account no renewal. W6DXC is using MOPA on 7 mc. W6ATR is an enthusiastic code man. W6EJN will have a crystal controlled 'phone rig soon. W6UP has a pretty note on 7 mc. W6EFN has 3.5 mc. 'phone. W6CKW is on 3.5 mc. 'phone. W6DVJ is new ham at Peora. W6DOW has disappeared. W6CWI is experimenting. W6AZM has QRM from copper smelters. W6DGN is now W9HAA of Wheaton, Ill. W6AAM moved to Denver. D6AMV is on 3.5 mc. 'phone. W6COI is on 7 mc. W6CKT has gone to coast to become M.D. W6DQW is in Detroit, Mich., where he will be heard signing W8LQ. W6DJH is working at KOY, Phoenix. W6DRE is now chief operator at KOY. W6EL is back in Prescott. W6CDU got married. W6HS is off air due business QRM. W6EAA is now KTAR operator.

Traffic: W6EFC 133, W6EUT 138, W6CBA 1, W6UP 86, W6EJN 76, W6CEC 81, W6CKW 8, W6CPF 325.

SAN DIEGO — SCM, H. A. Ambler, W6EOP — W6EPF leads the section this month. W6BKX is back with us again. W6AEP delivered six messages from Nicaragua. W6BGL is on 'phone. W6BAS has been keeping schedule with Pt. Arguella. W6EBX reports contacts with east coast. W6CNK will soon be on again. W6AYK reports a new ham in La Mesa, W6BZK. W6BAM took a trip to Washington. W6CTP reports. W6DNL has a new Ford. W6QY reports 14 mc. FB. W6DNS went to Los Angeles for visit. W6CTR is moving. W6DNW visited hams in Utah, Idaho, Oregon and Northern Calif. W6EOP is again back on 'phone. W6DAI is trying crystal control on 14 mc. W6BFB is rebuilding. W6EOL is back on the air. W6AJM has a new AC receiver. W6HY is building a receiver for his Motorcycle.

Traffic: W6EPF 32, W6BKX 26, W6AEP 19, W6EOP 13, W6BGL 12, W6BAS 7, W6EBX 3.

HAWAII — SCM, L. A. Walworth, K6CIB — This report was received at W6FFP by radio from K6COG and mailed to HQs. K6BOE turned in cards for WAC. K6AYD of Mid-Pacific Institute returned to Makawao Maui for the summer where he will set K6AYD up permanently. K6BAZ is QRL plans for Hawaiian annual convention. K6AJA fled to San Francisco on a business trip. K6YAL is closed down for the summer. K6ALM and K6ARO have acquired commercial tickets. K6ELN, K6AXK and K6ALM visited K6CIB at RCA Kahuku station. K6CIB is happy over winning second place in the May contest sponsored by Precision Crystal Lab of Springfield, Mass., and getting a fine Precision crystal for K6CIB 'phone. Thos. A. Jagger, a volcanologist, announces that a big eruption is probable soon and that emergency plans should be made. The SCM wrote him placing amateur radio at his command. K6CRW just connected his master oscillator. K6CAB is QRL teaching K6CIB how to become an RCA shift engineer. K6FCX, K6DV, K6COG and K6BOE turned in BPL scores this month.

Traffic: K6FCX 360, K6DV 305, K6COG 276, K6BOE 215, K6AJA 27, K6ALM 21, K6BJJ 13, K6ERO 10, K6CIB 5.

NEVADA — SCM, Keston L. Ramsey, W6EAD — W6AJP makes the BPL. W6UO kept schedules with W6AJP, W6ETM, W6BI and W6ADQ. W6CRF has received his license for 14 mc. 'phone. W6BTJ is working Alternate Control for the Naval Reserve. W6BYR is putting out 3 amps on 'phone and 5 amps on CW. W6EEF, Walter Hansen of Reno, just received his license. W6EAD is about ready to go on the air.

Traffic: W6AJP 149, W6UO 55, W6CRF 16, W6BYR 3.

ROANOKE DIVISION

VIRGINIA — SCM, J. F. Wohlford, W3CA — W3CXM says vacation in First District. W3AAJ has his hands full trying keep the Virginia Net working. W3CFL is working three bands. W3FJ is maintaining six schedules. W3IQ is recovering from operation. W3WO says fishing is rotten down his way. W3BUY sends his first report. W3BZ is on the air occasionally. John Boland of W3HY has hit it for the Great Lakes Training Station and will work the gang with W9CNC. W3FE is on 7000 kc. The Danville Radio Club will operate under the call W3ASC. W3AGH applied for ORS. W3BLU is still operating. W3BRY is new station at Lynchburg. W3BBX is going to camp. W3BIX is new station in Richmond. The Richmond Short Wave Club held a get-together on June 19th and the sixty-one hams attended. The Washington Club members were on hand in great numbers. The next meeting will be held in Roanoke on July 19th. W3BSW, a new call in Richmond, belongs to J. W. Ziesemer. W3AMB is with the Boy Scout camp this summer.

Traffic: W3CXM 411, W3BLU 117, W3BUY 105, W3FJ 81, W3HY 78, W3AGH 46, W3WO 33, W3AAJ 5, W3CFL 3, W3BZ 2, W3FE 2.

NORTH CAROLINA — SCM, H. L. Caveness, W4DW — During this month the following called at the SCM's: W4AA, W4TR, W4ABV, W4AK, W4AEL, W4ZB, W4RV. W4RX is still on the air. W4ZB will discontinue operation for the summer. W4RE has been to the beach. W4AAE says bugs are bad in his shack. W4AEL has been keeping several schedules. W4AIS has been working some ZLs and K6s. W4JR has come to life again. W4AKC now has an MOPA on the air. W4TR has moved into his new home on the Duke University Campus. W4ABW reports a new ham, W4APW, in Gastonia. W4AGO has attended C.M.T.C. camp. W4GG has returned home to W8DJQ. W4EV is a new ham in Raleigh. W4QU is new ham in Pittsboro. W4ABT says the gang in Winston-Salem has decided to put on a Roanoke Division Convention on September 25th and 26th. W4IF is doing good work. W4OG has not yet been converted to crystal control. W4AHI moved to a new location. W4EG has let up now that the fishing season is on. W4AVT is making a nice collection of cards. W4ANU is doing very nicely for a new ham. W4TN is on the air from his old location. W4AKB is new ham in Greensboro. W4TJ is rebuilding. W4RV has moved into a shack out in his back yard. W4RV, W4TR and W4OC report very nice times at both the Danville and the Richmond Hamfests. W4AJD is building crystal rig. W4APP is working DX.

Traffic: W4AEL 50, W4AIS 40, W4RE 23, W4ABT 22, W4AKC 14, W4DW 14, W4OG 13, W4IF 11, W4RX 8, W4AAE 6, W4TR 6, W4GG 1.

ROCKY MOUNTAIN DIVISION

UTAH-WYOMING — SCM, C. R. Miller, W6DPJ — W6DAM is doing excellent work. W7HX says QRN is bad on 3.5 mc. W6DPO is going to summer school. W6BSE has his TNT set working. W6DPJ rebuilt W6ZZZ. W7AAH was struck by lightning. W7ALI has been away.

Traffic: W6DPJ 209, W6DAM 45, W7HX 9, W6DPO 8, W6BSE 4.

COLORADO — SCM, E. C. Stockman, W9ESA — W9EFP now has a '10 TNT. W9GCM is teaching a number of future hams. W9DNP is keeping up the good work. W9EAM has cancelled all schedules. W9DQD just received a commercial ticket. W9EKQ, W9GBQ and W9ESA have new National SW5 AC receivers. W9CDE can still be counted on for regular AA schedule. W9DNT reports that W9FQK plans to move to Wellington. W9TX will soon be back again. W9EDM is operating at KFKA. W9GLP moved to Kansas. W9PO and W9FQJ are building push-pull MOPA. W9BTO is on the air again. W9APZ reports.

Traffic: W9DNP 55, W9BTO 32, W9EAM 4, W9FXP 4, W9CDE 3, W9DNT 3, W9FXQ 2.

SOUTHEASTERN DIVISION

WESTERN FLORIDA — SCM, Edward J. Collins, W4MS — W4FV leads the gang in traffic. W4ACB, our Route Manager, is second with a FB total. W4ARD-W6FCY turns in a nice total. W4QR reports lots of trouble getting a 3500-kc. 'phone modulated. W4SC, the FNG station, is making a FB record in attending drills. W4AUA is working hard getting his U.S.N.R. station together. W4AAX is putting out an FB crystal-controlled 'phone signal. W4DP says DX is FB. One op at W4AFT is married and the other is very busy with the "YLs." We welcome three new stations from Marianna this month: W4AUW, W4AUV and W4ASG. W4ADV is on with a PDC note. W4ARV is another low power station. W4UW-W5NO has a 50-watter. W4ART is on regularly. W4AWJ is beginning to crash out now. NDD, the U.S.N.R. station at Pensacola, has a new crystal rig that is really the feline's love call. W4HQ has been very busy with the Naval Reserve Unit. W4MX has been experimenting. W4ALJ has been remodeling again. W4AQI of Palm Beach has been in this Section on a visit. W4AOO has gone down to 3500 kc. with his 'phone. W4AQY has a new TNT transmitter. A hamfest was held at W4KB's in Valparaiso. Mrs. W4KB has applied for her operator's ticket. Another XYL that has applied for her license is Mrs. W4MS. W4AWC promises to be on before long. W4QK is heard regularly now. W4QU will soon be on with a 50-watter. W4ATN has been busy with the Navy. W4PN has changed QRAs. W4VR has dusted off his operating table. W4RK is thinking of moving over to Pensacola. W4GP of Mobile was a recent visitor to Pensy stations. W4OE is the operator of WCOA. We wonder what has happened to W4ADC. W4MS is still working on his crystal rig.

Traffic: W4FV 80, W4ACB 56, W4ARD 49, W4MS 25, W4SC 8, W4QR 7, W4ATN 3, W4MX 6, W4KB 9, W4ARV 2, W4ALJ 2, W4QU 4, W4QK 1, W4UW 9, W4ADV 3, W4AWJ 1, W4ART 1, W4ASV 2.

ALABAMA — SCM, Robert Troy, Jr., W4AHP — W4CB is at C.M.T.C. at Ft. McClellan. W4AJR is operating occasionally. W4KP is handling traffic. Ex-5ARG is now W4LO, and ex-5ARY is now W4VV. W4ARF is using low-power crystal control. W4ASM is rebuilding. W4AHP is writing this column. Hi. W4EF has gone to Texas.

Traffic: W4KP 58, W4ASM 23, W4AIH 73.

GEORGIA-SOUTH CAROLINA-CUBA-ISLE OF PINES-PORTO RICO-VIRGIN ISLANDS — SCM, J. C. Hagler, Jr., W4SS — W4BO steps ahead of all the gang this

(*Continued on page 72*)

• CALLS HEARD •

W2WC, Frank Anzalone, 138 Pine St., Cliffside, N. J.

14,000-kc. band

cm1fm cm2ay cm2cf cm2sh cm8uf cm8yb ct1bx ear96 g2cj g2vq g5by g5is g5wq g6wy gi5nj hc1fg hh7c k4bpf k4kd lu1ba lu2ea lu4da nj2pa pa0qq py1ca py2az py2ba py2bq py9ao ti2cb ve4ae ve5bh ve5fx vo8aw vo8mc vo8z w6ahp w6ahz w6ajp w6alt w6arp w6avb w6bbz w6bnp w6bvc w6cuh w6cyb w6dev w6dgv w6dkw w6ejc w6ew w6ih w6jn w6sc w6ud w6wb w7ab w7aqg w7bac w7mx iph

7000-kc. band

cm8uf cm8yb cn8jbt eareo ear116 g2ol g2vq g5by haf3d hh7c k4kd k4rj k4ug k6agi k6aja k6boe k6dmm tg1as ve4go ve4js ve9ej vk2dc vk2dy vk2lx vk2ns vk3bq vk3bw vk3bz vk3hk vk3hl vk3jk vk3ka vk3ml vk3nm vk3tm vk3wl vk3wx vk3xi vk3zx vk5gr vk5kw vk5lx vk5mf vk5wr vk7eh w6adp w6ahp w6ahz w6ain w6aka w6am w6amc w6aor w6axm w6ayh w6ash w6bbo w6bck w6bht w6bih w6bik w6bji w6bmf w6bsd w6bve w6bvg w6bvm w6bvs w6by w6byb w6byy w6bzd w6cqz w6eri w6csx w6etn w6euh w6evr w6exw w6dgv w6dio w6dli w6dms w6dqv w6dte w6dtm w6duf w6dzg w6eak w6ebn w6edj w6eep w6efk w6efv w6egm w6ehy w6ejc w6eqb w6ew w6exm w6exq w6ezg w6ezk w6ezq w6fei w6ffp w6gf w6jm w6pb w6qt w6sa w6sb w6sc w6sn w6sq w6vh w6tm w6wb w6zs w6zv w7aa w7aae w7all w7ano w7df w7fh w7ft w7fv w7mx w7qi x1ax z1-lar zl2ac zl2gq zl3as zl3ex zl4ao zl4 vn2bg

W9BYC, A. H. LaMont, 2507 12th St., Boulder, Colo.

14-mc. band

b7x ce1aa ce2xk ce3eh ce7an cm2ww cm5cx ct1aa g2vq g6rg g6wt hc2jm hh7c kfa5 k6erh lu1dv lu1dy lu2ea lu3de lu3fa lu4da lu4dq lu4dw lu8dj lu8djc oa4j oa4q oa4y oa4z pa0dw py1ah py1ba py1ca py1cm py1cr py1cx py2ak py2bf py2bm ti3xa xf4fa x1aa x1n x3a x9a

7-mc. band

cm1mn daiv f3mta hh7c ka1ce ka1dj ka1xa k4rj k6aja k6boe k6ees k6edd k6eme k6erw k6dmm k6ene k6oa lefh lu2ea nn1nic oa4v om1tb ti3xa v1ja vk2ns vk3hk vk3ml vk3wl vk5aj vk5it vk5gr vk5mb vk6mo vk6wa waq xlf x5e x9a xl1ar zl1cc zl1fe zl2ab zl2bz zl2dj zl2gn zl3aa zl3ab zl3aj zl3aw zl3cc zl3cm zl3et zl3ev zl4ap zl4ba zl4bl

W8UD, Box 266, Milford, Ohio, April 1, 1930

Calls Heard During March, 1930 on 14 Mc.

ce1ah ce2ab ce3ag ce3bf ce5aa cr4ad ct1aa ct1bk ct1bx ct1cw ct2ab ct2ac cx1oa d4xn ear37 ear96 ear98 f8aw f8axq f8dh f8dm f8er f8ex f8fg f8fk f8fo f8gi f8gq f8ha f8hr f8hw f8lgb f8pr f8ro f8sm f8swa f8wr frearb g2bm g2cj g2cx g2gd g2gm g2ip g2rk g5bj g5bz g5is g5ml g5ms g5tz g5wk g6gs g6qb g6rb g6vp g6wt hc1fg hc2jm i1ll iph k4kf k6alm k6boe k6bxw k7anq k7mn k7pq lu1bz lu3de lu3dh lu8dj lu9dt oa4j oa4l oa4q oa4t oa4z on4di on4dj on4eu on4fp on4ie on4gn on4hp on4jj oz7by pa0fp pa0qf pk2aj py1ah py2ak py2ba py2eb su8rs vk2cd vk2ek vk2hb vk2hc vk2lj vk2rc vk2rx vk3cx vk3go vk3pa vk3pm vk3pp vk4rb w6aqj w6aqq w6at w6awa w6aya w6ayg w6bax w6bbm w6bgc w6bjv w6bqg w6btg w6btm w6bto w6btz w6bvz w6byb w6cbp w6cce w6cei w6chu w6chy w6clx w6cjn w6cqz w6cs w6cur w6cxw w6dca w6de w6djp w6dk w6dob wfbt xearn yi1lm zl1aa zl1an zl1ao zl1as zl1fe zl1fr zl1fu zl2bg zl2bx zl2cd zl2gm zl2gq zl3as z3cm zl3cp zl4ao zl4bo

W9DDQ, Chas. P. Weaver, 1374 Ouerbacker Court, Louisville, Ky.

14,000-kc. band

b7x ce1ah cm2ar cm2ay cm2bo cm2jm cm2jt cm2rz cm2sh cm2wd cm2xa cm2xd cm8by cm8uf cm8yb cne ct1aa ct1ae ct1bx ct1by ct2ac cx2ak ear39 ear65 f3mta f8eo f8ex f8mre f8smi fq8hpg g2ao g2by g2nm g2vq g5by g5ml g6rb g6wt hc1fg hh7b k4akv k4alk k4dk k4kd k4kf k4rj k5xo lu3dh lu3fa nj2pa nl8mre nl8smi nn1gb oa4j oa4q oa4z on4gn pxmg pxr py1ah py1aw py1ay py2ak py2ay py2ba py2bk py3af rx1aa as1ap ax5m ti3xa v1yb ve1an ve1ar ve1ap ve1bd ve1bl ve1br ve1cc ve1co ve1dm ve1dr ve2aa ve2ac ve2ae ve2ap ve2as ve2ay ve2bb ve2be ve2bg ve2br ve2bw ve2ca ve3ab ve3ae ve3cf ve3da ve3dd ve3fl ve3fq ve3gx ve3ha ve3he ve3wk ve3wr ve3xc ve4ae ve4ai ve4bb ve4bc ve4bd ve4be ve4bq ve4bu ve4bx ve4cu ve4cv ve4db ve4dk ve4ec ve4ei ve4fx ve4gq ve4gl ve4gp ve4gw ve4hm ve4ho ve4hu ve4hw ve4hy ve4jb ve4jc ve5ak ve5ao ve5aw vo8ae vo8ao vo8lk vo8mc vo8or vo8z voqh vq2ba vq3stm wdde x1a x1aa x3a x9a x9b xee xoq xf8oxo xu5wa xw2zp yk2xx ys1ap ys1x zl2ac zs1p zs4m

I1ER, Santangeli Mario, Via S. Eufemia 19, Milano, Italy

7000-kc. band

1adg 1aeh 1af 1afc 1ahx 1apj 1aqs 1arf 1atp 1ava 1avl 1asz 1azy 1bga 1bsg 1cde 1cio 1fc 1fk 1fm 1gww 1mk 1mx 1sz 1ys 1zz 2adp 2adt 2acf 2af 2agr 2akm 2alu 2amr 2ans 2atz 2auu 2awl 2ax 2bds 2bdw 2bq 2bik 2bse 2bto 2ced 2ccj 2cek 2cex 2clh 2clu 2csz 2fu 2ju 2ova 2qf 2rek 2rr 2ry 2sg 2 = 3aer 3aho 3aqk 3arz 3bem 3bet 3bfh 3cxl 3kx 4abs 4abt 4abv 4aea 4aen 4afz 4aiv 4ed 4ei 4fr 4ft 4gb 4gw 4iv 4ll 4lvn 4ug 4vu 4zh 4jx 4zv 5ck 5ds 5jc 5ww 8aup 8bcg 8bea 8bis 8bjk 8bml 8coo 8dh 8mj 9bcl 9cne 9epg 9erz 9rp cm1by cm1gy cm1xe cm2jm cm2vd cm3xa cm3rz vo8aw ve2be pc3pc au7kal qns ken x4m kx4

VK3BZ, G. I. Morris, Boundary Rd., Mordialclo S. 12, Vict., Australia

7000-kc. band — W stations

w1erw w3md w5uf w6aku w6am w6aov w6bbp w6der w6dtt w6dww w6ebo w6egh w6eke w6eqm w6erk w6ezg w6kn w6lw w6tm w6wg w8ald w9ces w9evd w9rt ka1cm ka1hr k6boe k6eqm om1tb pk1vh pk3bq vs6ag vp1az

14,000-kc. band

ct9aa d4wad d4cxz f8pz g2ao g2cj g2lz g5by g6rb g6wy he2jm j1dr j1dv j2cx lu3de oa4v oa4z ok2op pk1ca pk3bq vs6ag vs7ap w8cra xu2uu

3500-kc. band

w4qv

W6EIM, H. L. Messier, 1116 No. Maryland Ave., Glendale, Calif.

7000-kc. band

zl1aa zl1as zl2ab zl2ac zl2bz zl2be zl2gr zl2gw zl2gx zl3as zl3aw zl3cm zl3co zl4ap zl4bk zl4ho vk2ho vk2ac vk2es vk2dw vk3es vk3aa vk3rg vk3lr vk3wz vk4do vk4dy vk5hg vk5wr vk5ho vk6fl vk6mu vk6sa vk6bm vk7jk vk7cw vk7ch ac2co ac3uy ac8hm ac8tj ac8zw ka1ab ka1hr ka1ce ka1cm ka1ht ka1pw j1dv j1dp j1dy j3cc j3cs x1na x9a x29a hc1fg nn1nic nn7nic lu2ea ce1aa ce1ah zs2b zs5u zs5m zt6x vp1az vq1ap hh7c vo8aw ys1ap pz9oo r9o tir2 k4kd f3ocg cp1ab xe8m xe8n ozsa kgqv

• I. A. R. U. NEWS •

Devoted to the interests and activities of the

INTERNATIONAL AMATEUR RADIO UNION

President: H. P. MAXIM *Vice-President:* C. H. STEWART *Secretary:* K. B. WARNER

Headquarters Society:
THE AMERICAN RADIO RELAY LEAGUE, West Hartford, Conn.

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Wireless Institute of Australia
Wireless Society of Ireland

Conducted by Clinton B. DeSoto

A FEW random observations on various aspects of international amateur radio come to mind this month which may as well be said as not. One of these is on the subject of competitions of probable international effect sponsored by national sections, and is a particular thorn in the side of the A.R.R.L. Communications Department.

Quite frequently such contests are scheduled and run off by societies in various countries. Usually they are rather dependent upon help from other nations; many times such help is definitely requested. Yet — and here we use the A.R.R.L. as an example because it is the one with which we are most familiar — such a request, if made, invariably arrives from one to three weeks too late for inclusion with any of the special and regular bulletins which supplement and expedite *QST* mention of a coming event. In other words, insufficient time has been allowed for preparation for the contest. Result: Very limited or no adequate coöperation possible.

Amateur radio has been international in character for nearly ten years, emphatically so for seven. Yet in the matter of coöperative *operating* arrangements between national societies, it lags annoyingly. More foresight and preparation, and far more preliminary time to exercise these, are prime requisites for the careful institution and flawless conduct of reciprocal international competitive arrangements — and are only adequate tribute to the invariably excellent spirit of participating radio amateurs.

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While at the time of writing summer static has laid its clammy hand with varying heaviness over our three lower frequency bands, thus cutting out most of the unusual DX that has been experienced in the 3.5-mc. region during the past winter and spring, we can look back on a series of remarkable international achievements which certainly show that increasingly the "sun's in the sky; all's right with amateur radio." Just take a look at this:

C. A. Gehrels, PA0QQ, on 3500 kc. at Eindhoven, Holland, dates May 19th to 22nd, gave complete reports on reception of the following number of United States stations: 20 first district, 10 second district, 9 third, 2 fourth, and 2 eighth districts stations. 41 stations, all between three and four thousand miles away, and all within three days. Reminiscent of 7 mc. at its best, isn't it?

That's just one example. Several east coast and northeastern United States phones have been reported at good strength in the Antipodes. Two-way c.w. contacts with all continents except Africa and Asia have been reported; possibly contacts with these countries have occurred but gone unrecorded. If the sun continues to shed its spots at the present rate, six months from now should see WAC on 3.5 mc. a quite conceivable and even commonplace thing.

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In connection with this question of sun-spots, we have had several amateurs writing in here apparently very much surprised and considerably perturbed to learn that 14 mc. was still a usable band and had not faded dismally away into limbo. This, it seems, was expected after the theory of sun-spot cycle changes as affecting radio wave propagation had been considered in the February editorial. Somebody must be wrong — either the band or K. B. W.!

That, of course, is not the case. It is our private belief that, disregarding for the moment seasonal

and fifteen-month changes, 14 mc. has not as yet quite reached the zenith of its long distance efficiency. Consideration of the periods involved and the general range of frequencies usefully refracted and reflected by ionized atmospheric layers and the earth itself indicate that the ideal condition of skip distance maximum and attenuation minimum for long-distance communication varies for each half of the 11.1-year sine curve from (very generally speaking) 10 to 25 mc. Given as the time, August 1, 1931, the frequency, 14 mc. — conclusions are obvious. But we reiterate that the observed harmonics of these long-time changes mentioned before must be considered carefully before calculating conditions for any specific period of time.

PA0WR, OWNED AND OPERATED BY H. M. AKKERMAN, DEVENTER, HOLLAND

is built with the precision and mechanical nicety of a fine instrument. All the leads are silvered tubes; clips clamp to condensers and coils making solid connections; the complete transmitter is mounted on glass. The valve, a Philips TBI/50, is placed in a t.g.t.p. circuit, supplied with 1000 volts r.a.c. Frequency, approximately 14,150 kc. Antenna, half-wave Zepp.

The station is heard in nearly all the world. All Europe had been worked by 1925; nu3BCO supplied the first real DX on May 31, 1927.

While summer static introduces still further troubles at the moment, recent practical results taken from amateur work seem to bear out these generalizations. Witness the International Test at the end of last winter. Witness recent 14-mc. DX Time-tables appearing in these columns. Witness the occasional slight success still being had with 28 mc., if that means anything in this connection. The tantrums of "40 meters" last fall and winter, and the significant utility of 3500 kc. this year furnish contributory evidence if not direct correlatives.

Amateurs, by virtue of being very much the largest transmitting group in radio, have excellent facilities for observation and compilation of these changes to aid in the advancement of the radio art as a whole. Yet our very numbers preclude thorough and complete organization to undertake such study as a unit. It remains then for interested individuals and small groups to make use of these facilities through contact with amateurs everywhere, and assimilate material privately and not as a body, in this manner. This procedure automatically sifts out those competent and willing, and still preserves the great expanse of amateur radio as a mighty working laboratory. Such a plan depends on individual effort and initiative rather than organization and ballyhoo. It will require a lot of patiently expended time and quiet observation and extensive work.

But the reward to those few fellows who will certainly undertake the effort of examining closely, so far as amateur radio can go into this matter of understanding and isolating the subject of radio wave propagation, will be great. Work toward this end through the next three years will see marvelous results and great contributions to the art. Dig in, fellows. Let's get at the truth.

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Comes now H. Ray Carter, VK2HC, second station in all the world to acquire the WAC-on-phone certificate, and testifies that he has accomplished that feat three separate and distinct times since doing it first nearly two years ago. And that's what might be termed modulating some pretty elastic ether waves, say we.

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But there's another probable record among the phone WAC-ers this time. At 0540 G.C.T. on the morning of May 11th, G5BY and W6AJ hooked up on c.w. In a few moments G5BY changed over to phone. This was successful, so W6AJ did the same. Twenty minutes of highly successful working followed, with the Californian QSA3–4 and perfect modulation, a bothersome rapid fading alone preventing a QSA5 report. He reported O'Heffernan to be a quite steady QSA3.

Is this the first actual England-California two-way phone contact? The participants believe so. G5BY, third WAC-on-phone, has been in the game long enough to know something of its records, too. Any other claimants, or other records?

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A new QSL address for Cuba. Silvio Hernandez Godinez, announced in April *QST*, has arrived in the United States, where he plans to continue his education. The new forwarding agency will be CM2WD, Pedro Madiedo, calle Santa Rosa, Buen Retiro, Marianao, Habana, Cuba.

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"I want to put *Iraq and that Asian contact for WAC* before every station west of Kurdistan and Iraq!" Thus does Kenneth S. J. Rancombe XYI6KR, continue his campaign for amateur radio in Iraq. With a half dozen stations now on

(*Continued on page 78*)

• CORRESPONDENCE •

The Publishers of QST assume no responsibility for statements made herein by correspondents.

Ultra-High Frequencies

Somers, Mont.

Editor, *QST:*

May I offer a few words which may be of value to the many amateurs who will, I hope, be drawn by the editorial in June *QST* to experiment with the Barkhausen-Kurz oscillations mentioned in that editorial?

In a demonstration at a meeting of the Heinrich Hertz Society in Germany, Dr. K. Kohl, of the University of Erlengen, demonstrated some very interesting experiments with 14-cm. radio waves. These waves, it is stated, are conveniently produced with vacuum tubes by placing a strong positive charge on the grid of the tube and a relatively slight negative charge on the plate of the tube. In these experiments, however, a specially constructed tube was used, having a spiral grid 7 cm. or one-half wave-length long.

With waves only 14 cm. long, it was easily possible to demonstrate beautifully such phenomena as reflection, refraction, diffraction, and polarization. The waves were detected and amplified by a crystal detector with two stages of audio amplification. It was, of course, necessary to tone modulate the waves in order to receive them with this apparatus. The receiving "antenna" was a half wave-length long and the crystal was set in the middle.

It is reported that telephone conversation was carried on successfully over an experimental range of 1500 meters, using directional apparatus. This directional equipment was of somewhat the same construction as Mr. Reinartz' heater reflector, mentioned in the editorial.

Circuit diagrams or other data on these experiments are not readily obtainable, but I should be pleased to hear from any amateurs or others who are able to do any experimental work with waves of this or similar length.

— *A. E. Richmond, W7AHF*

1715 Kc.

14 N. Michigan Ave., Chicago, Ill.

Editor, *QST:*

I note the recent stir in *QST* regarding the use of the 1715-kc. band and feel that you are greatly to be commended for trying to raise a little interest in this amateur band. I would like to call to your attention the fact that successful communication has been carried out over considerable distances in the past. D. A. Griffin, J. M. Tiffany and myself used to operate old NU2AGB in 1922 and '23 and used to work the Pacific Coast with ease. Our signals were consistently heard in Europe, too.

These efforts were crowned with success when we carried on two-way communication with British 2JL at Liverpool in October of '23. This, mind you, on a frequency of 1500 kc. with about 750 watts input to a Hartley oscillator. A Western Electric super was used as the receiver. J. M. Tiffany, at present operating 2CGK, was the operator on watch at this particular time and the work was corroborated by a ship's operator in mid-Atlantic. We are under the impression that this was the first amateur two-way work with Europe.

I hope this letter will arouse a little more interest in the 1715-kc. band.

— *John H. Dodman, W9GA, ex-2AGB*

Calls Heard

620 Pearl St., Richmond, Ind.

Editor, *QST:*

With reference to the letter from W3QP in June *QST*, I think he has the right idea toward the publishing of Calls Heard. Before the calls get to the press from some remote part of the world they become stale and *passé*. There are no doubt articles which are not put in *QST* because of lack of space in that issue. If this space were available an article or articles which would do a great deal more to help the ham than do the stale Calls Heard could be published.

I also like my DX as does W3QP, but the only way to get the kick out of it is to actually contact with it. It used to be that when a station was heard some distance it was something to crow about, but that is not so now with the modern transmitters and higher frequencies where everybody has a chance for a QSO, not just to be heard. Let's have some more of such comment in *QST*.

— *J. M. Worley, W9CMQ*

More About Calls Heard

Pomona, Calif.

Editor, *QST:*

I notice a letter in June *QST* from W3QP stating that he wishes discontinuance of that time-honored department, Calls Heard. He goes on to say that he wishes technical articles to be used in the space now occupied by Calls Heard.

Primarily, I feel that *QST* is not strictly a technical magazine in the way we think of that word "technical." I think that *QST*'s purpose is to build friendly spirit between amateurs, along with the education of amateurs by good and useful technical articles.

In *QST* one will always find good technical articles; one will also find things of general interest which cannot be said to be technical. One of these is Calls Heard. These are useful to any active amateur. Calls Heard will tell him just how his signals are getting to a certain location during the preceding month. He may be unable to work a location but as he glances down the lists of Calls Heard he might see his call listed from a location he has never worked or has been unable to work during the past several months. Won't that encourage him? What if a ham has not been able to work much or any DX and finds his call listed in Calls Heard from Siam? That will certainly encourage him — *and how.* I am willing to say that Calls Heard certainly has saved men from quitting the game for the above reason.

Shall we QRT Calls Heard? I say no, and I think thousands of amateurs in the U. S. A. and Canada will agree with me.

— *W. S. Foote, W6BAG*

AARS vs. QRM

458 S. Harris St., South Bend, Indiana

Editor, *QST:*

For the past two months I have been listening to the AARS work on Monday nights. Now I'm not an AARS or boast of having a crystal sig, but keep silent on Monday nights lest I QRM some AA station, probably with important traffic to push through. That's the point I'm driving at — yes, QRM! And plenty of it from non-AA stations, rotten sigs, fists, procedure such as — "rrrrr ok OM sorry didn't get all, QRU hr QTC? — rr ok FB OM QTC 2 ur way, QSP? — rrrr ok OM have to QRT nw OB sorry cant QSP!!!"

Such operating. Bah! If they must do that, why not save it for Tuesday night? Now if all the non-AA stations would remain silent on Monday nights, wouldn't that be sweet? Couldn't the AARS work in harmony without any non-AA QRM? These AA stations are doing this work for some reason — must be a good reason.

Let us non-AA's give them a decent chance. Surely we can sacrifice this one night out of the week and give the fist a rest. Listen in and learn some real procedure. It will do us good. What say fellows? All in favor say aye! And stay off the air Monday nights. Yeah! let's terminate.

— *Frank Cserpes, W9GGJ*

Another Suggestion

1623 Irving Ave. N., Minneapolis, Minn.

Editor, *QST:*

I've got something on my mind that I don't recall having heard anybody else yell about, so here goes. Why can't every ham hold down his

transmitting code speed to the speed that he can receive? It would certainly speed up traffic and everything else in general. The slow beginners would be able to find each other and not annoy the big shots — as they seem to do according to some of the letters published in *QST*. Also the fast commercial ops could get together and chew the rag and exchange traffic.

For instance, if W9XYZ heard W8MNO calling CQ at 15 w.p.m. he would know that W8MNO could only receive that fast. Then W9XYZ answers the call at 20 w.p.m. which is his best receiving speed. W8MNO hears him and comes back and gives him all the dope at 20 per. Likewise W9XYZ comes back at 15 per and everybody is happy. Both know if conditions are OK that everything they say will be received all right. Such a method as this would eliminate the ham who comes back and says "Sorri OM ND bad QRM" when he means QRS, and also that guy who says "Ur msg no. 11 all OK RRR," when he should say, "I can't copy that fast."

What do you say, gang, that we give it a try? It might save a lot of damage to the cat if you are of the "Old Man's" nature, and perhaps quite a few messages that now end up in a waste paper basket will be delivered.

— *Burton S. Waldron, W9AKN-W9CTT*

The Communications Department

(*Continued from page 64*)

month and leads our Section in traffic. W4PM's antenna was down for about two weeks. W4QE says that the West Georgia Radio Club has planned SOME program for the coming months. W4AHT reports from Ft. Moultrie, S. C., where he is attending the C.M.T.C. W4IS is back on the air. W4WN has schedule every morning with the Fla. 'Phone Net. W4AJ worked 2 VKs, and also a K4, CM, and a VE in 2½ hours one morning. W4IR sends in a good traffic report. W4QZ is building a low-power 14-mc. 'phone. W4SS lost his sky-hook in a wind storm. W4ADD works his brother, W4ATM, every day. W4MA misses the A.A.R.S. schedules. W4AOR introduces two brand-new Hams, W4ASB and W4AVS. W4GT, W4AAY, and W4SS started to Columbia for a club meeting but, due to car trouble, never made it. CM8UF and the YF will be in the U.S.A. for a vacation. CM8YB is on the air once more after a trip to Los Angeles. W4AVM says that they are organizing an Amateur Radio Club in Spartanburg, S. C. W4AAY has a new low-powered transmitter on 14 mc. W4WZ's new CC set works fine. W4AMM is a newcomer in Savannah. W4BW reports that W4WN, W4ATI, and W4AEV attended the Convention in Thomasville, Ga. The Macon Amateur Radio Club had an enthusiastic meeting. W4WB and W4BW new ORS. W4CE, W4IJ, and W4ARC came to Augusta recently to meet the gang. W4AOX blew nearly everything that looked like a condenser in his transmitter. W4AEK worked his 29th country. W4AUU worked 6 G's in one week. W4AAS was one of the debators at the annual school debate at Lanier High School in Macon. W4WB visited W4PM and W4IR while in Atlanta. W4AMA, portable W4PAM, is on the air at the R.O.T.C. Camp at Ft. Benning. W4JD paid a visit to the fellows at Tallahassee and Panama City, Fla. Sickness has kept W4AAZ down for several weeks. W4CF and W4BR are busy. W4ANW is off the air permanently. We are also sorry to lose W4KA, who is now at Chattanooga, Tenn. W4ZW is experimenting with PP transmitters. W4PJ is busy with the R.C.A. course. W4MN has been busy with a meeting of Seismologists at the U. of S. C. W4LL reports that W4UC has one of those June (Hull) *QST* Receivers. W4WQ reports from Pocasset, Okla. He hitched-hiked out from Atlanta (1100 miles) in eight days. W4AHG is working on a PP transmitter. W4IJ is in Ridgeway, S. C., for the summer. W4KL is with the Atlanta Police Radio station. W4KI

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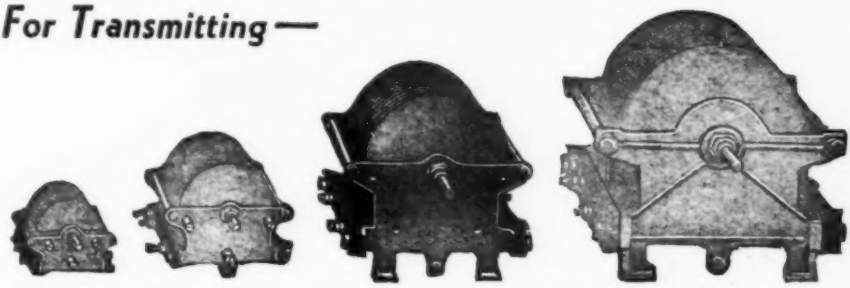

Midway (*Featherweight*) "Standard" 16-B 166-B

This transmitting model is primarily intended to meet requirements where condensers for moderately high voltages are indicated of a size between our Construction Design 166-B and our smaller condenser designs such as T-183, T-199, etc.

It is possible to furnish in the Construction Design 16-B, greater airgaps, and higher capacities in relation to airgaps, than could well be done using our smaller transmitting condenser design as mentioned above, and still retain adequate structural strength and a proper balance betweed the various elements. Likewise condensers of low capacity with airgap equivalent to that in our standard 166-B may be furnished in this construction.

The 16-B can be supplied with promptness and within reasonable limits as to capacity and breakdown voltage. Standard airgaps (actual airgap between adjacent rotor and stator plates) are .168 inches and .294 inches, but condensers with airgaps of .231, .122 and .090 inches can be furnished on special order. We solicit inquiries for special sizes.

The figures given below indicate a few possible sizes. The number of plates determining increase or decrease in capacity can be accommodated to suit special requirements, provided that an overall depth behind panel of 11 inches, as indicated for Type 3276, is not exceeded.

Construction Design 16-B, Type Nos.	Max. Cap.	*Air Gap	No. of Plates	Depth Behind Panel (*Overall*)	List Price
3279	315 mmf.	.168 in.	31	9 9/32"	$34.00
3280	147 "	.168 "	15	5 13/16"	31.00
3281	84 "	.168 "	9	4 1/2"	28.00
3276	160 "	.294 "	25	11"	32.00
3277	80 "	.294 "	13	6 7/8"	30.00
3278	47 "	.294 "	7	4 13/16"	28.00

*Actual airgap between adjacent rotor and stator plates. All plates have well rounded edges and are highly polished overall.

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"THE STANDARD OF COMPARISON"

will be traveling most of the summer. W4DL is a new member at Atlanta. W4GT has gone to Calif. for three months. It is with deep regret that we hear that K4KD is no more; he is going home to Illinois for good. While on the air in Porto Rico he did wonderful work for the A.R.R.L. and the U.S.N.R. There has been a statewide Amateur Radio Organization formed in Thomasville, Ga. They have had their first meeting with 25 members, and all paid their dues and elected the following officers — W4ASZ, Pres., W4WN, Vice-Pres., and W4KX, Sec.-Treas., and Editor. Meetings are to be quarterly and will be real HAMFESTS. There is to be a monthly magazine devoted to Amateur Radio. For all information write to W4KX. W4AFQ-W4PAY has been sent to Richmond, Va., for the present with the Eastern Air Transport, Inc. W4AJH is changing his QRA to Milledgeville, Ga. W4AQN is working on 14-mc. CW and 3.5-mc. 'phone. W4AMG has gone to Iowa and is going to bring his brother, W9AMV, back with him. W4QQ, W4OQ and W4AQB are inactive for the summer. The High School-Junior College Station, W4APM, is also off until fall. W4DV is driving to Wisconsin for a stay of a month or so.

Traffic: W4BO 78, W4PM 39, W4QE 36, W4IS 36, W4AHT 26, W4WN 26, W4AJ 25, W4IR 21, W4WB 18, W4QZ 16, W4SS 11, W4AAD 10, W4MA 8, W4WQ 8, W4AOR 7, W4HN 7, CM8UF 6, W4AVM 6, W4WZ 4, W4BW 4, W4CE 4, W4AOX 4, W4DV 3, W4AEK 3, W4AUU 2, W4AAY 5.

EASTERN FLORIDA — SCM, E. M. Winter, W4HY — W4FM has been suffering from school QRM. W4SK has been busy trying to earn shekels. W4MF keeps schedules with W4ABL. W4MM sends the SCM pictures of his YL (Oh Me), W4AKA's YL (OW!) and one of W4MM and W4AKA together. Burrell Shaw, down in Tampa, kept 14-mc. schedule with W6EMS. Hal Berry handled a lot of traffic on 3.5 mc. W4JO has moved to new QRA. W4TK reports a merger between W4NN and (Miss) W4ABG. Result — Mr. and Mrs. W4NN. W4AHK has just completed a push-pull TPTG. W4AIA is building a new receiver. W4NB visited W4AHK during his visit to Umatilla. W4SQ keeps several schedules. W4AKJ is worrying about the Radio Inspector. W4ABL is known as the static hound. W4ASA and W4AFN report via radio through W4OK. W4AEM handled traffic from an oil exploration expedition on the delta of the Orinoco River, South America, which was using the call "FX." Also worked Danish Motor Ship *Nordkap*, 800 miles WNW of Balboa, using call OXYE. W4MM copied three official broadcasts. W4AWD applies for ORS. We have a new club — The Vero Beach Radio Club; has 20 members. W4QP and W4AQL are both working on 'phone. W4ALL is running a '10 red hot. W4BG-NDU is the official U.S.N.R.F. station. Somebody sent us a card from Jacksonville reporting six messages handled, but gave no call and signed no name. W4EQ is just starting up in Miami. W4WS acted as a clearing house for Florida 'phone traffic. W4AKI reports reception good. W4EY is leaving for Savannah to take out the S.S. *Schokarie*. W4ADB spent a week at the meter school in Gainesville. W4ASQ is doing 'phone work. W4AKL will be on soon. W4MF's report got in late. Miami reports W4QY plans to stay in New York permanently, in the vicinity of Elmira. W4NE has assumed the secretaryship of the Miami Amateur Radio Club. The Miami Amateur Radio Club is going along fine. Raised their initiation fee to $5.00, which includes a copy of the Handbook and a year's subscription to *QST*. W4MD is getting the kinks ironed out of a new 3500-kc. 'phone rig. W4CJ has a low-power 'phone job on the air. W4NK is going strong on 14 mc. W4QF recently received a report from Australia. W4CR is on 14 mc. W4ABA has worked some mighty good DX. The Miami gang visited the Palm Beach and West Palm Beach bunch, and had a "large time." W4AO is on with 'phone. W4AGR is using 211 tubes on 14 mc. W4LA is now in 7 mc. W4AKL, operator at WJAX, is now a "paying guest" at W4NN's summer cottage at Jacksonville Beach. W4TK can always eat a piece of cake before he jumps in the ocean for a swim. W4RU was a recent visitor at W4NN's. W4HC has rebuilt. W4NC has trouble with his 50-watter. W4UX laments the fact that a 5-watt tube won't stand 2000 volts. W4AGY is back on the air after a year's silence. W4MD and W4QL have been keeping 'phone schedules. W4AFL is building a Pentode receiver. W4AON wants to know what a storage battery looks like. W4AMQ is moving to Haven Beach for the summer. W4ANZ at Keystone Heights, formerly W8OF of Washington, Pa., is an old-timer. W4UH has built a new speech amplifier. W4BN has a new 7-mc. CW rig. W4BN-W4PAP

is an ORS now, as is W4SQ. W4UK gave a party at his home in Jacksonville during the past month, at which time there were about a dozen 'phone men present, including W4DU, W4ER, W4RU, W4EY, W4UL, W4HY, W4FM, W4MF, W4PK, W4AS. W4HC handled monthly reports from the gang down the state. W4HY is rebuilding. The Jacksonville Amateur Radio Operators Club is sponsoring the Official Southeastern Division Convention which will be held in Jacksonville, September 18th and 19th. All hams interested are requested to get in touch with W4HY for reservations. Cecil Ffoulkes, formerly SCM for Florida, is now chief operator at WCSC, Charleston, S. C. Had a mighty fine report from W4VP at Daytona Beach. W4ASR is also on the air there. W4CR is the new Route Manager for the Miami Territory. W4OO is now W6EDF, 462 W. Monterey, Pomona, Calif.

Traffic: W4ABL 83, W4AKI 16, W4SK 5, W4MF 19, W4AJK 18, W4JO 4, W4TK 3, W4AHK 12, W4SQ 10, W4ASA 20, W4AFN 22, W4OK 32, W4AEM 15, W4MM 28, W4AWD 30, W4BG 4, NDU 40, W4UL 6, W4QP 5, W4EQ 8, W4WS 106, W4ASQ 30, W4NE 2, W4MF 17, W4AGB 3, W4NN 16, W4HC 12, W4VP 6.

WEST GULF DIVISION

NEW MEXICO — SCM, Leavenworth Wheeler, Jr., W5AHI — W5AUW was off for more than a week with a case of flu. W5BQE and W5AHI ran a series of tests on 3.5 mc. and found that band ideal for daylight work over reasonably short distances. W5AOE reports again. W5TV is leaving us for good in favor of San Diego. We "hear tell" of two new stations in Raton, W5AU and W5AOH.

Traffic: W5AHI 414, W5AUW 81, W5AOE 22.

NORTHERN TEXAS — SCM, Roy Lee Taylor, W5RJ — W5BII wants to become an OBS. W5AUL reports organization of a U.S.N.R. net in Abilene and also one more new ham, W5AXK. W5LU makes a good showing. W5HY reports having to sit on ice while he QSP's. W5ARV is attending Boys Camp in Colorado, where he is signing W9HFS. W5QY just got a new '52. W5WW has received his Sweepstake Certificate for Northern Texas. W5LY worked four foreigners with his new MOPA. W5AGQ has just returned from Memphis, Tenn., where he installed WNBR. W5KL has dropped out again. W5BQN is operating a portable transmitter at Boy Scout Camp at Palo Pinto. W5BG has his 3.5-mc. 'phone going fine. W5BGW is working in Dallas. W5BAD hasn't got on since he has been in Cow Town. Old-timer W5XY is with us once more. W5QE, W5VH and W5YG paid a visit to the SCM this month.

Traffic: W5BII 59, W5AUL 28, W5RJ 21, W5LU 23, W5HY 18, W5ARV 18, W5QY 16, W5WW 9, W5LY 7.

SOUTHERN TEXAS — SCM, H. C. Sherrod, Jr., W5ZG — Houston: W5TD has been on vacation. W5LB has been spending most of his time on 14 mc. Wilson reports

(*Continued on page 84*)

Northwestern Division Convention

Hotel Tacoma, August 29th–30th, Tacoma, Washington

ALL aboard for Tacoma! Doc. Spike, chairman of the convention committee, of the Tacoma Radio Club, has both arms extended to welcome all amateurs residing in the division who attend the convention on Saturday and Sunday. After registration, there will be golf matches and prizes will be given for those good or otherwise. A.R.R.L. Headquarters will be represented, the Army and Navy will have communication officers present and it is hoped that Doctor Woodruff, professor of electrical engineering of State College, Pa., and director of the Atlantic Division will be one of our guests. A scenic trip up the Puget Sound is being planned, and the club will do its best to make you remember this convention for a long time to come. Meanwhile any further information may be obtained from Dr. F. C. J. Spike, W7OS, 635 Rhodes Med. Arts Building, Tacoma, Wash.

I.A.R.U. News

(*Continued from page 67*)

the air, contacts and reports are earnestly desired. QSL's to any YI stations will be promptly delivered if addressed to Rancombe at his new address: R.A.F. W/T Section, c/o No. 1 Batt. Iraq Assyrian Levies, Diana, near Rowandus, Kurdistan.

He reports conditions during the spring months on the 14-mc. band to be good at intervals, but QRN always troublesome. The weather was stormy until May 15th, but W stations came in well from 2100 G.C.T. to 0100. Many were called, but only one report was received. Europeans often give XYI6KR R8, and he cannot understand missing the W's, unless it is screening from the nearby mountains which are 10,000 feet high. South Americans and Canadians are not coming in as well as they did at the same time last year. The 7-mc. band has been very moderate, but terrible QRN and QRM bothered. W's get over on this band also.

6KR is on daily from 1800 to 0100 G.C.T. on 14 mc. Messages concerning schedules will gladly be QSP'ed by G6ZR, who comes in well in the United States. The parting word is to the effect that they had 22.5 inches of rain in five days, 3000 feet above sea level. Should we say now: "And that's Asia"?

Australian Report

By W. G. Sones, *Federal Publicity Officer*

Considerable activity is being manifest by the Federal Technical Development Section, which is also the Victorian Section. The energetic secretary is G. Glover, VK3AG, and he is assisted by a useful team including R. O. Cherry, chairman of the Section, M. Howden and W. Gronow. Most of the work of the Section is being concentrated on the investigation and preparation of the sub-standard frequency meters, crystals, and allied material. The construction of sub-standards to the order of Divisions is in hand. The crystals have been checked by the Postmaster General's Department, and have proved to be very close to the rating calculated by Mr. Howden. Additional equipment authorized for purchase by the Victorian Division for dual use in the laboratory consists of two Morse ink recorders and a thermionic voltmeter.

In addition, for the Victorian Division, work on the construction of VK3WI is under way. The transmitter will be of considerable interest, and will be equipped for both code and 'phone work.

The Federal Secretary has been informed by the P. M. G.'s Department, in reply to our further request, that the matter of commercial stations operating in amateur bands has been made the subject of a protest to the Berne Bureau.

Membership figures for the several divisions are as follows:

New South Wales	111
Victoria	180
Queensland	110
South Australia	180
Western Australia	131
Tasmania	58
	770

The annual reports for all Divisions indicate that the acute financial position of the country is affecting amateur interests in various ways; nevertheless, great credit is due the Divisional secretaries for fostering the developmental work and for the increase in membership noted herein, in spite of the added difficulties.

Belgian Report

By Paul de Neck, *Pres. Reseau Belge*

The Council of the Reseau Belge is now composed of the following members:

President: Paul de Neck, ON4UU, Eng. AIM's, 312 rue Royale, Brussels
Vice-President: R. Kersse, ON4GW, banker, 13 Avenue Nouvelle, Mortsel, Antwerp
Sec'y-Treasurer: Louis Pecher, ON4RO, 172 rue Americaine, Brussels
Members of Committee:
Baron Bonaert de la Roche, ON4HM, Chateau de Marchienne, Harvengt, Hainaut
M. Cosyns, B9, Eng. ULB, 41 Avenue des Nerviens, Brussels
J. P. De Ridder, ON4HF, 22 rue de Varsovie, Ostend
Robert Deloor, ON4SA, Eng. SAIT, 26 Avenue du Mont Kemmel, Brussels
L. Hunninck, ON4UA, 76 Avenue du Midi, Brussels
Baron G. Jannssen, ON4BZ, Chateau de Hemptinne, Ciney, Namur
Joseph Mussche, ON4BJ, 63 Boulevard Poincaré, Brussels
Georges Neelemans, ON4FT, 15 rue du Luxembourg, Brussels
Marcel Ocreman, ON4FU, 31 rue Leopold Courouble, Brussels
A. Rombauts, ON4AI, Dr. Radio Conferences, 30 Place Jamblinne de Meux, Brussels
Verspeyen, 62 Boulevard Albert, Ghent
E. Ziane, ON4ZZ, 44 Boulevard Frere Orban, Liege
R. Verstreppen, ON4AA, 23 rue Van Straelen, Antwerp
M. Dierckzsens, ON4CZ, 36 rue Quellin, Antwerp

Our membership is now 450, with 20 members in foreign countries.

Norwegian Report

By G. H. Petersen, *Pres. N.R.R.L.*

We want to draw attention to our member, LA2K, who will take part in the Norwegian Scientific Greenland Expedition this summer. With a 15-watt transmitter he will be out for amateur QSO's in the 14-mc. band, using the call

XLA2K, during the period July 20th to September 12th. His principal working hours will be around 1700 G.C.T. Reports are welcomed by the N.R.R.L.

Conditions on 14 mc. are exceptionally fine, DX coming in very regularly. On 7 and 3.5 mc. QRN has been almost hopeless most days of the month.

South African Report

By Dr. S. H. Walters, S.A.R.R.L. Correspondent

Conditions now, with the onset of winter, are as usual very indifferent. DX is non-existent except for isolated cases. Wipe-out and skip distance begin in the early afternoon, and a QSO is often left in mid-air for those not using break-in.

But the hams are wearing their fingers away grinding crystals as is evident from the new CC QRI's that have turned up. The super-het craze has also taken hold, largely as a result of several excellent articles in "QTC" by G2DT.

'Phone has been thrown open again with no time restrictions beyond an injunction to observe the amateur spirit, and to give no flattering reports to indifferent 'phones.

WAC Club membership must be too easy, as at the recent conference someone suggested a WEC (Worked-Every-Country) award. What will United States District 7 have to say to this when it comes to working all of South Africa?

The following additional British Report was received too late for insertion in alphabetical order with the remainder of the national reports.

British Report

By J. Clarricoats, Hon. Sec'y R.S.G.B.

The outstanding event during June was the relaying of loyal greetings to our Patron, H. R. H. The Prince of Wales, from all B.E.R.U. sections. Full details of the Loyal Relay will be published in the T. & R. Bulletin for July.

The B.E.R.U. Challenge Trophy has now reached Australia, and arrangements are being made for its presentation to Mr. Trevor Evans, VK2NS.

During the summer months in England many of our Provincial Districts have held conventionettes. The following centers were chosen for these meetings, all of which were well supported:

Birmingham — Mr. Fred Miles, G5ML (District Representative)
Nottingham — Mr. Jack Lees, G2IO (D.R.)
Newport — Mr. Harold Harding, G2HH (D.R.)
Bristol — Capt. Courtenay Price, G2OP (D.R.)
Hull — Mr. Tom Woodcock, G6OO (D.R.)
Tunbridge Wells — Mr. H. A. M. Whyte, G6WY (D.R.)

The Sixth Annual Convention of the R.S.G.B. and B.E.R.U. will be held in London on September 25th and 26th. Overseas amateurs will be very welcome to this ever popular event. Full particulars can be obtained from our headquarters, 53 Victoria St., London, S.W. 1.

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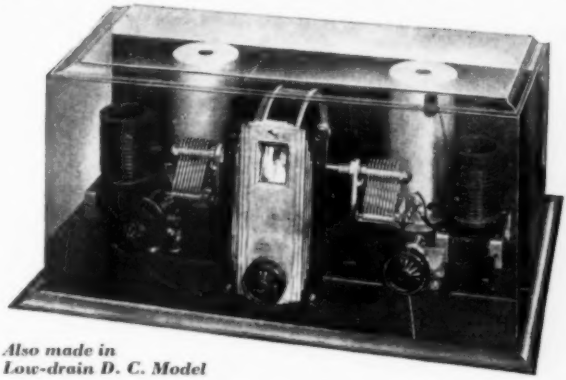

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872	5	10	7500	2.0	$12.00
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Amateurs of Great Britain and elsewhere were very grateful to Mr. K. B. Warner and the E.D.R. executive council for the prompt publication of a statement outlining the results of the C.C.I.R. meeting in Copenhagen.

R.S.G.B. will almost definitely be represented at Madrid, and we trust all other European countries will attempt to make similar arrangements. We are convinced that even if the national society delegates are debarred from the actual convention meetings, it will be of great benefit if they can meet together daily and discuss matters which are to be dealt with by the government representatives.

The Communications Department

(*Continued from page 76*)

that his brother, W5EW, at Sugarland is active on 14 mc. W5AVU has finally succeeded in getting the MOPA to feed the voltage-fed hertz. W5AMX is a new ham in Houston. W5ANW is not heard so regularly these days. W5EI has been doing some good AARS work. W5VK is still trying to get the 3500-kc. 'phone to work. W5BUB is conducting the code class at the Houston Amateur Radio Club. W5AFV worked two VKs with a '45. W5BRF worked five of same using two '47s. W5AHW is a new ham. Galveston: W5ARR is the sole representative here. W5BQJ is still on 3500-kc. 'phone. W5AUX is off the air on account of a burnt-out rectobulb. W5BTK is on regularly. W5AVC is still in San Antonio. College Station: W5AQY is closed down until the resumption of activity at A & M College in the fall. W5AEB is a new ham in Bryan. Noxville: A mighty nice report was received from W5HX. W5HX says that Junction will be represented shortly by W5AYB. Rosenberg: W5PU is attending the summer session at the University of Texas. San Antonio: W5AUC is attempting to establish reliable traffic schedules. W5ADC and W5ADX are taking vacations. Tom Speer, a new ham at Brooks Field, will be on the air before long. Harry Wells of PMZ fame is a cadet at Brooks Field. W5AYR has been off the air for the past two months. Another newcomer is W5OW. Austin: W5CT reports the following: W5KA still on 3500-kc. 'phone. W5KV disbanded and its ops, W5ATW and W5OV, returned home. W5BB is in Maine for the summer with a portable. W5VV is Allison, the well-known tennis star. W5CT is on with a new MOPA. El Campo: W5ACT has sold out and joined the Navy. W5BTH, W5BQD and W5ACK bought out W5ACT. W5SY has been on a little. W5BEG is a new ham. El Paso: W5ES is using a 50-watter with '66s. W5ES has been handling quite a bit of traffic with X29A. Other hams in El Paso are W5FW, W5AOT, W5DE, and W5AFS. Corpus Christi: W5MS made the WAC Club this month! W5MX is having trouble with AC receivers. W5ZX has a new ham going. Baytown: W5DS has been busy erecting a new 55-foot zepp.

Traffic: W5MS 8, W5CT 95, W5AUC 530, W5BKW 15, W5AQY 22, W5LB 62, W5AEB 20.

OKLAHOMA — SCM, Wm. J. Gentry, W5GF — W5VQ tops the list and makes the BPL again. W5OJ won the Sweepstakes Contest for Oklahoma. W5AMC is building an AC receiver. W5BOE is hitting a high batting average at traffic. W5ALQ is a new station at Stroud. W5BPM plans to overhaul his transmitter. W5AEI is a new station. W5PL has been busy trying to make coin. W5AYN has been making pictures of the harvest on his wheat ranch. W5BHU has a new crystal rig. W5PP has a nice total. W5ALF says QRN put his batting average down. W5ABO is burning up the 14 mc. band. W5AAV is also on 14 mc. W5QL is building a hot rig. W5AFH has been sick. W5APY is on 7 mc. W5BRD is trying to get a receiver perking on 14 mc. W5BSS is down on 14 mc. W5ALD has a '32 in final stage. W5BPF is interested in boats. W5GA is building an MOPA. W5OAV is going to build a 'phone rig. W5GF is trying to keep cool.

Traffic: W5VQ 1447, W5OJ 212, W5AMC 113, W5BOE 83, W5PP 37, W5ALF 12, W5GF 9, W5PL 9, W5AEI 8, W5BPM 2, W5APY 2, W5ALD 25.

CANADA

MARITIME DIVISION

NOVA SCOTIA — SCM, A. M. Crowell, VE1DQ — Stations taking part in the many FB six- and seven-way 3.5-mc. 'phone hook-ups are VE1CL, VE1BA, VE1BO, VE1AU and VE1AK all of New Brunswick, and from Nova Scotia VE1AG, VE1CA, VE1DQ and VE1BN. VE1AX has the new hi-power outfit ready to perk. VE1AG is having good success. VE1CC, VE1BL and VE1AS have pooled their resources and erected a real ham shack.

Traffic: VE1AG 12, VE1DQ 9, VE1CL 6.

QUEBEC DIVISION

QUEBEC — SCM, Alphy Blais, VE2AC — VE2BL, Frenette in Quebec City, VE2BF, Fortin in Metabetchouan, VE2DF, Mosher in St. Lambert, VE2CQ, Lariviere, St. Lambert, are new additions to the Section. VE2CA has been heard in Ceylon. VE2BB is tickled pink with the results he gets on his new outfit. VE2BE is on his vacation. VE2AP is actively pursuing his work in getting the best outfit on the air. The McGill University station closes down for the summer. VE2CU, VE2CX, VE2CO are going steadily on all bands. VE2AC is busy with tests on 28 and 56 mc. The active stations at present are: VE2CM, VE2BY, VE2AV, VE2CU, VE2HV, VE2DN, VE2BO, VE2BG, VE2CQ, VE2CO, VE2CJ, VE2CL, VE2CX, VE2AI, VF2CR, VE2AM, VE2BB, VE2BE, VE2CA, VE2DX, VE2AP, VE2DF, VE2BL, VE2BF, VE2AC. VE2CX is coaching two prospective amateurs. This Section did fine work in the Empire relay, sending messages to H. R. H. Prince of Wales for his birthday.

Traffic: VE2AC 172, VE2BB 19, VE2AP 2, VE2BO 4, VE2CA 2, VE2CO 2, VE2BE 20.

VANALTA DIVISION

ALBERTA — SCM, G. F. Barron, VE4EC — VE4EA is knocking the heavyside layer for a loop. VE3DT reports with traffic. VE4CY received two heard cards from Russia and one from New Zealand.

Traffic: VE4CY 3, VE4DT 5.

BRITISH COLUMBIA — SCM, J. K. Cavalsky, VE5AL — VE5FI is in hospital. VE5BC is trying all bands. VE5DD is working split tricks. VE5AL and VE5AC spear an occasional message. VE5BN is working on 3500. VE5AM is a new ORS. VE5CW is on again. VE5CH has several schedules. VE5CO worked Peru on 14 mc. VE5EC slipped back to 7 mc. VE5DQ continues to blow filter condensers. VE5CB is on with MOPA. VE5DF has gone to sea again. The Victoria gang had a great picnic at Chateau Island where VE5HP made DX on the pies. Hi.

Traffic: VE5AC 7, VE5AL 7, VE5EC 2, VE5CH 35, VE5HP 2, VE5AM 11, VE5FI 3, VE5BC 4.

PRAIRIE DIVISION

MANITOBA — SCM, A. V. Chase, VE4HR — VE4BQ rebuilt his transmitter. VE4AR's 14-mc. 'phone is being reported in Europe. VE4DJ is working overtime for a W.A.C. certificate. VE4JB made his first DX contact. VE4HR is building a receiver for 60 and 30 mc. VE4DK is at Camp Borden.

Traffic: VE4AR 24, VE4DJ 18, VE4HR 8, VE4BQ 2.

SASKATCHEWAN — SCM, W. J. Pickering, VE4FC — VE4CV has been able to maintain one schedule. The new transmitter at Gravelbourg College is perking under the temporary call of VE4MC. VE4IH has three daily schedules. VE4BE is QRL with YLs, ball and farming. VE4GR is using 'phone. VE4CM is on the air again. VE4AV reports little activity up her way. VE4DA and VE4BX are working with the Dept. of Natural Resources installing and operating stations in north Saskatchewan for fire protection work.

Traffic: VE4CV 13, VE4IH 8, VE4BE 3, VE4GR 3, VE4AV 1.

VE4AG is now using TPTG push-pull. VE4IU is rebuilding. VE4IS now uses a bug. VE4BQ received confirmation of Hong Kong QSO. The Winnipeg Radio Traffic Association and the Telegraphers Radio Club have united into a new body, to be known as the Manitoba Wireless Experimenters Association. The following officers were elected for the 1931-32 season: Honorary-President, VE4BQ; President, VE4AG; Secretary-Treasurer, VE4DP; Ass't Secretary, VE4FH; Provincial Representative, VE4GG.

ONTARIO DIVISION

ONTARIO — SCM, C. D. Lloyd, VE4CB — VE3QB is on the air daily. VE3HB has gone back to zepp. VE3AD and VE3XL are on the air occasionally. VE3AR is operating VE9BX. VE9BW is using a 250-watt crystal job. VE3OC is rearranging his lay-out. VE3FJ is having great results. VE3GP has been active. VE3XA is going to return to traffic. VE3FB is experimenting with 56 mc. VE3BY and VE3WA are new hams at Windsor. VE3IB is using a '45. VE3AA is looking for a Toronto schedule. VE3GL is rebuilding. VE3HC worked K4UG, and one English station. VE3CE is going to rebuild during the summer. VE3HA is looking forward to increased activity. VE9AL has taken to the air with his plane. VE3HN says all schedules off until fall. VE3LM and VE3TM report. VE3GK gets on for a few hours each night. VE3BV has changed his QRA to 351 Keewatin Ave., Toronto. VE3AU is a new ORS. VE3ID is using 14 and 7 mc. for the summer. VE3CD has been busy with exams. VE3TT is a new ham at 55 Lawrence Ave. West, Toronto 12. The Western Ontario Amateur Radio Association held another most successful annual picnic at Waterworks Park, St. Thomas, on June 21st, with between forty and fifty members and ladies present.

Traffic: VE3QB 1, VE3HB 5, VE3GP 38, VE3HC 133, VE3HA 5, VE3AA 7, VE9AL 11, VE3HN 49, VE3GK 27, VE3AU 177, VE3ID 7, VE3CD 172.

LATE AND ADDITIONAL REPORTS

KA1HR continues the splendid work. K7ANQ is Alaska's one and only YL. W8OK keeps bunch of schedules. W9DOE handled NN1NIC traffic.

Traffic: KA1HR 553, K7ANQ 79, W8OK 68, W9DOE 90.

Midwest Division Convention

(Continued from page 36)

supplemented by a demonstration of a five-meter oscillator and antenna system. Meyer Frieberg of Lincoln, Neb., followed with a talk on carrier wave elimination in phone transmitters and described an amateur transmitter incorporating several unusual features.

Six-thirty saw the entire group gathered at the Sheldon-Munn Hotel for the annual banquet. Under the direction of "Roastmaster" Kerr things kept moving at a lively pace. The speakers included Mr. D. C. Faber, Director of the Engineering Extension Service; Prof. J. C. Jensen of Nebraska Wesleyan University; C. M. Jansky, Jr., formerly an A.R.R.L. director; T. A. Hansen, Junior Radio Inspector; Lt. H. P. Roberts, Ensign C. H. Morgan, George Hansen, and George Grammer. L. L. Lewis, a senior electrical engineering student at Iowa State, demonstrated a remarkable new power tube in a phone transmitter, and successfully QSO'd a wise-cracking Swedish amateur, much to the enjoyment of the audience. The Swedish ham turned out to be Ben S. Willis, Assistant Professor of Electrical Engineering. Then followed the two time-honored institutions of amateur radio conventions — distribution of prizes and the liars' contest. The latter brought forth some noble efforts, with Professor Jensen's corn story being adjudged the "tallest."

The second day's program opened with a talk by Prof. Jensen on the development of transmitting and receiving sets from the early days of radio to the present time. Mr. Jansky followed with a paper on broadcast station coverage and

field intensity measurements, illustrated by lantern slides. After a short adjournment for lunch the meeting was resumed with Lt. Roberts on the floor. He spoke interestingly of his experiences in the Philippines with PI1HR and his subsequent travels in China and Japan visiting amateur stations. Mr. Hansen, who had been busy giving license examinations for the two days, then told the audience something of how the amateur appears to a radio inspector, and emphasized the necessity for frequency observance. Prof. G. W. Fox of Iowa State College followed with a talk on quartz crystals which gave the gang some new light on this subject. Carl Menzer, Director of WSUI, the Iowa State University Station, finished the technical part of the program with a rapid-fire talk on modulation, illustrated by lantern slides of oscillograms showing what happens in phone transmitters when things aren't adjusted right. The remainder of the afternoon was spent in an inspection of the engineering department of the college. This ended the convention program, but the rag-chewing kept on at a great rate for hours afterward.

Much appreciation is due Mr. Faber for the coöperation of the Engineering Extension Service, to the Campus Radio Club, Director Kerr, SCM Hansen and the others who worked to make the convention the success it was. Those who were there this year will not want to miss it next.

— *G. G.*

An Inexpensive Temperature Control Crystal Oven

(Continued from page 49)

provided to house it, the protruding end of the thermometer, and the thermo-regulator.

The heater units are a 50-watt bulb and a 25-watt bulb. Since it is impracticable for the amateur to have a crystal oven operating constantly, because of the cost, a 50-watt lamp bulb is used to raise the temperature quickly to 45° *C.* If your purse can stand it, it is better to have the oven in operation constantly and bring up the temperature more slowly. After the 50-watt bulb has raised the temperature to 45° *C.* it is switched off and the 25-watt bulb is switched on to keep the temperature at 45° *C.* The 50-watt bulb raises the temperature to 45° *C.* in about 8 minutes. The heater circuit is shown in Fig. 2.

Since the small "angle" thermometers cost at least $5.00 a *large* Centigrade angle thermometer (−10° to +50° *C.*) was provided and cost but 75 cents.[1] In order to reduce the arcing at the thermo-regulator contacts a 0.25-μfd. condenser is connected across them. Without it arcing is likely because the contacts open and close very slowly.

The chief reference used in the construction was the December, 1930, *Proceedings of the I. R. E.*

[1] Henry Hiel Chemical Mfg. Co., St. Louis, Mo.